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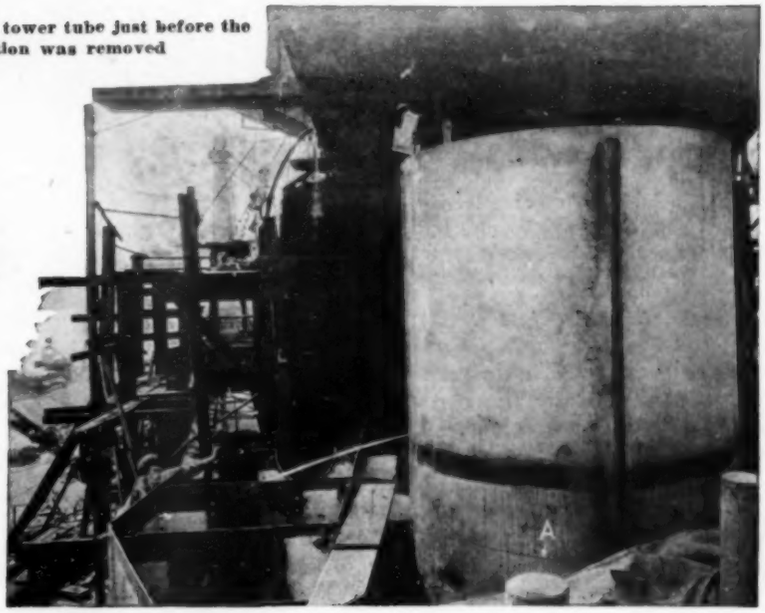
Fig. 1—Conning tower tube just before the top section was removed



An Armor Plate Ordeal for TUNGSTEN-CARBIDE

By Henry A. Ingram

Lieutenant, Construction Corps, U. S. Navy

THE HULL construction department at the United States Navy Yard, Puget Sound, has recently completed the difficult and unusual job of machining face-hardened nickel steel armor plate by utilizing the peculiar cutting properties of tungsten-carbide after ordinary cutting tools had repeatedly failed.

In connection with certain alterations to the bridges of the U. S. S. *California*, it became necessary to cut off the upper end of a vertical armored tube. This tube was 60 in. inside diameter, 92 in. outside diameter, with walls 16 in. thick. The tube was an assembly of three equal segments with radial butts, keyed together with nickel-steel dove-tail keys, and with butt-straps bolted over the joints on the inside. The armor segments were made of the highest grade 3 per cent nickel steel of which the outer surface was face-hardened to a depth of several inches by a carburizing process. The carburizing had been omitted along the vertical butts of each segment during manufacture in order to permit the abutting surfaces and keyways to be machined.

Frequent attempts to machine such face-hardened armor in the past have invariably been unsuccessful, as the tool breakage has been so great as to make such operations out of the question. In a few instances it has been possible to drill small holes into the hardened face. Another method, was to grind through the hard face, drill overlapping holes through from the back, and then grind the ridges between the holes down smooth. Still another scheme was to use a very high pressure oxy-hydrogen blow torch or lance. For thicknesses as great as 16 in., however, the flame of the torch will wander, leaving great swirls and ridges in the burnt surface. At the same time, the ballistic properties of the armor will suffer, and the burnt surface will become so hard that it cannot be cut by any tool. Also, there exists the danger of "spalling", which is a phenomenon wherein large, or small, pieces of the hardened face are cracked off and thrown with great violence, caused by

Comparison of Methods for Cutting Armored Tube

Overhaul period, 90 working days — Method Proposed		Difficulties of Proposed Methods: Danger of Spalling with Reduction of Ballistic Qualities of Armor.	Difficulty of Procuring Tools.	Time Required. Unit—5 Days.	Excessive Cost. Unit—$1,000.	Complexity of Apparatus.	Ragged Cut.	Difficulty of Drilling Tap Bolt Holes in Hardened Surface.	Need of Removing structure Outside Tube to Make Outside Cut.	Disposal of Hot Slag. Fire Risk.	Dust.	Protection of Workman Against Heat and Fumes	Excessive Tool Breakage.	Total. Factors x Marks.	Relative Standing.
	Factor	20	3	20	5	5	10	20	10	3	1	1	2	100	
A	Burn entirely through from inside with oxy-hydrogen torch	10 200	1 3	1 20	0.5 2.5	1 5	10 100	10 200	....	10 30	....	10 10	....	570.5	7
B	**Cut entirely through with boring mill set up inside tube.**	**6 18**	**4 80**	**5 25**	**5 25**								**8 16**	**164**	
C	Cut from inside and outside with grinding wheels.	2 60	5 100	4 20	6 30				10 100	....	10 10	....	6 12	278	2
D	Cut through hard surface with grinding wheel; burn from inside with oxy-hydrogen torch.	2 40	3 9	3 60	2.5 12.5	6 30	9 90	9 180	10 100	9 27	5 5	10 10	2 4	567.5	6
E	Cut through hard surface with grinding wheel; cut from inside with boring mill.	9 27	5 100	5 25	8 40				10 100	....	5 5	....	6 12	309	3
F	Cut through hard surface with grinding wheel; drill row of radial holes from inside.	10 30	9 180	9 45	10 50	9 90	....		10 100	....	5 5	....	8 16	516	5
G	Drill row of radial holes entirely through from inside.	7 21	10 200	10 50	7 35	9 90							10 20	416	4

the release of the stresses set up in the carburizing process. There have been several instances where workmen have been killed or injured by flying spalls.

The plan of the alterations required that a horizontal cut be made 103 inches from the top of the armored tube. This cut had to be normal to the axis of the tube, reasonably smooth, and such that flat plates could be secured to the cut surface with 3-in.-diameter tap bolts into the armored tube. The ballistic properties of the armor had to be preserved. In order to complete the alterations on schedule time it was estimated that the actual cutting operation must be performed in about twenty working days.

In order to make some rational choice of a method to follow, a chart was prepared, which enumerated the various schemes, and showed the advantages and disadvantages of each one. Twelve considerations were each weighted with a factor in proportion to the relative importance of the difficulty. The various factors totalled 100. After studying every con-

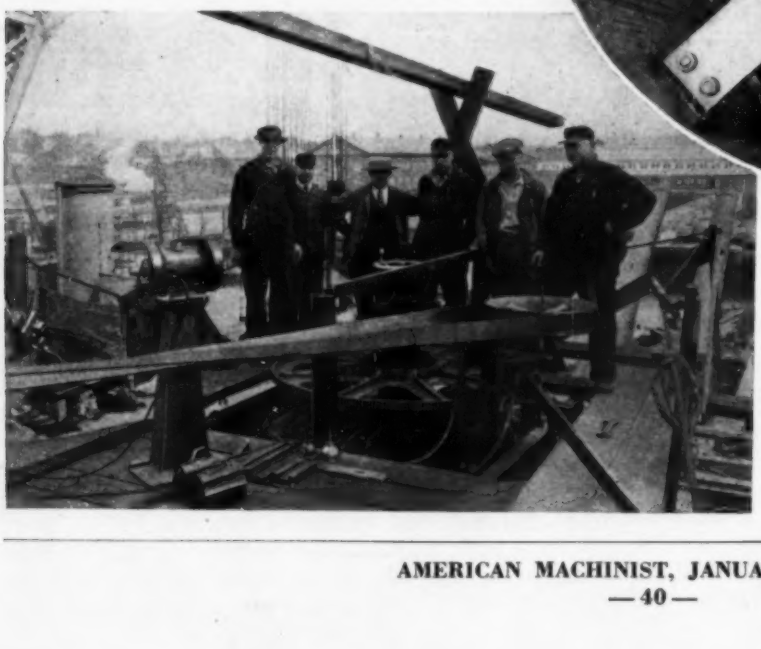


Fig. 3—Above—Boring bar in position. This view shows the work after several inches had been cut. The character of finish shown could have been secured by no other method

Fig. 2—At left—Boring rig on top of tube. A telephone connected this work station with the mechanic operating the boring bar

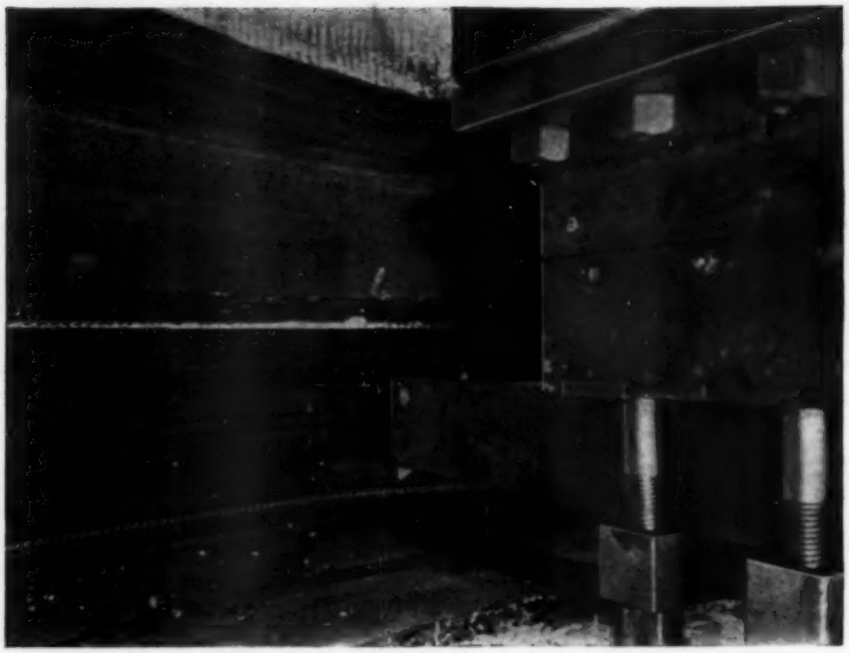


Fig. 4 — View of cut when 14 in. had been removed from inside surface. The 10-in. boring bar proved to be too light for the purpose, the tool chatter being apparent

ceivable scheme, the most promising ones were reduced to seven. Then, each scheme was examined in regard to each expected difficulty, and the scheme involving that difficulty in the greatest degree was given a mark of 10 with the other schemes marked in proportion. The total of the products of each mark multiplied by its factor was an arithmetical estimate of the difficulties of the proposed scheme.

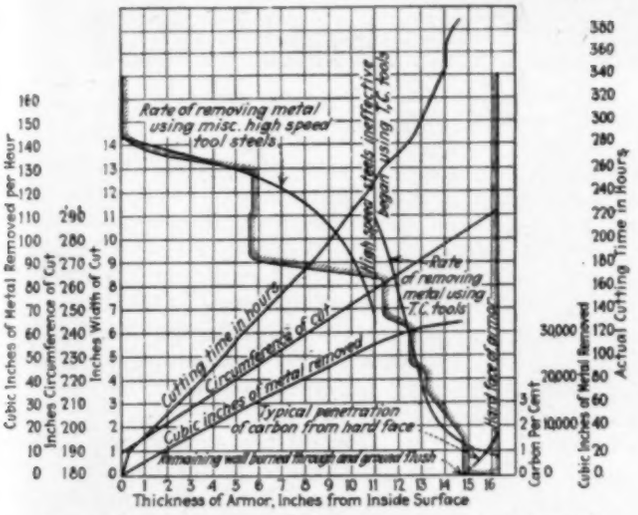

Rate of removing metal using misc. high speed tool steels
Rate of removing metal using T.C. tools
Cutting time in hours
Circumference of cut
Cubic inches of metal removed
Typical penetration of carbon from hard face
Hard face of armor
Thickness of Armor, Inches from Inside Surface
Cubic Inches of Metal Removed per Hour
Inches Circumference of Cut
Inches Width of Cut
Carbon per Cent
Cubic Inches of Metal Removed
Actual Cutting Time in Hours

Fig. 5—Charted comparative performances of high-speed steel and tungsten-carbide

For instance, the danger of spalling with the consequent reduction of ballistic properties of the armor was given a factor of 20. Method A, burning entirely through with an oxy-hydrogen torch, embodies this difficulty in the greatest degree and was consequently marked 10. The product of the mark and the factor was 200. The total of all such products for method A was 570.5. Of all methods considered, method B with a total of 164, appeared to offer the fewest objections.

The table herewith shows the seven methods that were considered the most practical. The natural reaction of almost any engineer familiar with mechanics and with the problems involved, would be to choose method A. Yet an analysis of the different factors that enter into the problem show it to be the least desirable. There was no predilection toward the use of tungsten-carbide tools, and their acquisition involved a considerable outlay, while the means of cutting with a torch and drilling were available. The method adopted, therefore, was chosen because it most nearly met the conditions imposed by the nature of the work.

In order that this method be successful it was essential that cutting tools be obtained that would be able to cut a hitherto unconquerable material. The information in current technical magazines in regard to tungsten-carbide gave promise that it might be successful where ordinary tools had failed. In order to test this presumption, a scrap piece of face-hardened armor sixteen inches thick was set up on a large boring mill in the machine shop and a bowl-shaped cut made in it, working from the tough back down to the hard face. High-speed steels successfully cut the metal to within three inches of the face, although the rate of cutting had to be gradually diminished as the hard face was approached. The local representative of tungsten-carbide-tipped cutting tools lent the yard a small sample tool which proved able to cut the hardened face of the armor successfully, where the other tools were ineffective. As a result of these tests method B was finally adopted. Eight side tools and four cutting off tools, $1\frac{1}{4}$x$1\frac{1}{4}$x7 in. were purchased at $720 cost.

The boring bar was installed in the tube as planned and was aligned absolutely plumb to the main reference plane of the ship by simultaneous readings of gunner's quadrants on the bar and on the roller path of the adjacent gun turret.

Cutting operations then began with various makes of high-speed cutting tools. The three butts of the armor were open about $\frac{1}{8}$ in., and as the tool crossed over the cracks, very severe jolts were given to the entire mechanism. After running for about twelve hours, several of the teeth in the main gear wheel failed. This gear was made of cast steel. A day's work completed the adaption of a different type of gear train using a large bronze gear wheel on the shaft. Several failures of small gears in the feed mechanism caused temporary delays. The boring bar was too light for the job, and had to be carefully nursed.

The cut was first made $14\frac{1}{2}$ in. wide, and was then stepped down in width as it became deeper. This was done to allow the tool holder to follow behind the tool

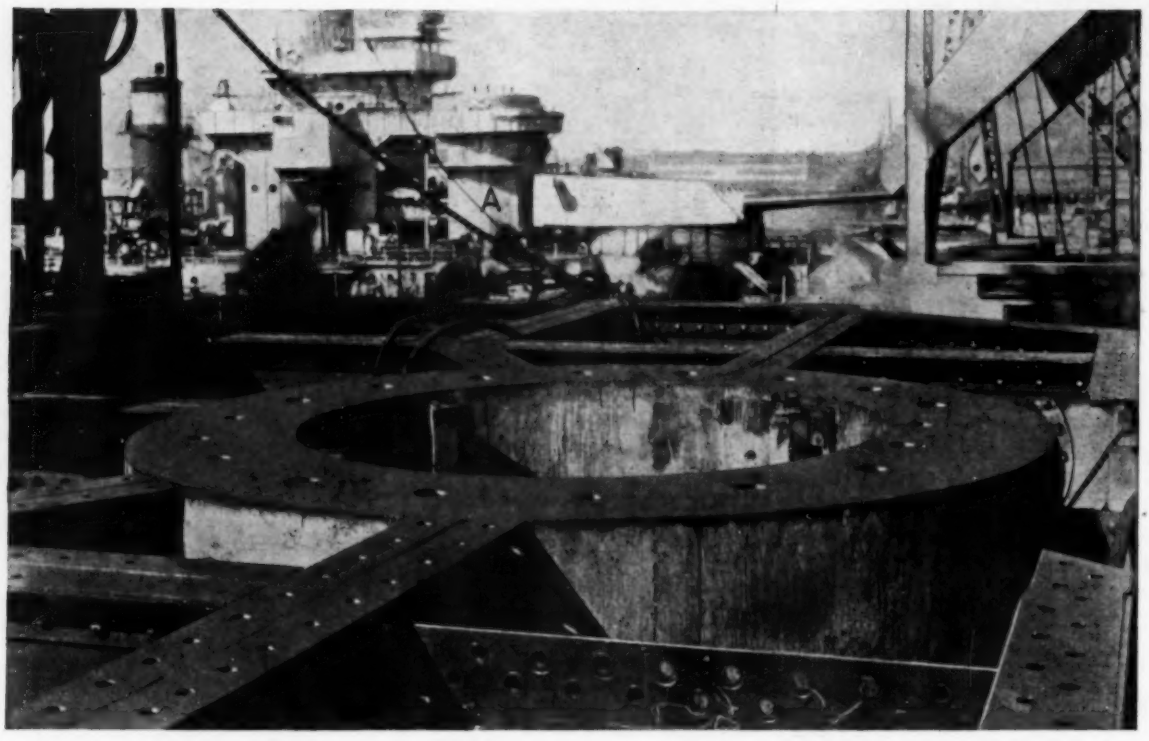


Fig. 6—The finished job ready for its cap. A similar conning tube with its casing is visible at *A* on the other battleship

into the cut, as otherwise the overhang of the tool would have been prohibitive. A cross-section of the profile of the cut is shown by the shaded line on Fig. 5. The vertical feed mechanism of the bar caused the tool to travel up and down the cut as it rotated. The tool was set in at the beginning of each cut to take as heavy a cut as the tool would stand. In most cases a freshly sharpened tool was inserted at the beginning of each cut.

The high-speed steels were used as long as they operated efficiently. When the cut reached a depth of 11 in. these tools failed so rapidly that it was necessary to regrind the tools before they completed a cut. At this point the tungsten-carbide tools were put into use. They worked successfully and were used to a depth of 14¾ inches although the feed per cut had to be continually reduced. At this point, because of the overhang of the tool and the lost motion between the cutting head and the bar, a severe chattering began which placed the tool under a great handicap. Frequently the tool would run into extremely hard spots. Although at this depth the butts were tight, and the shock from that cause was eliminated, the tool was running alternately into the annealed soft areas adjacent to the butts and then into the hard carburized areas.

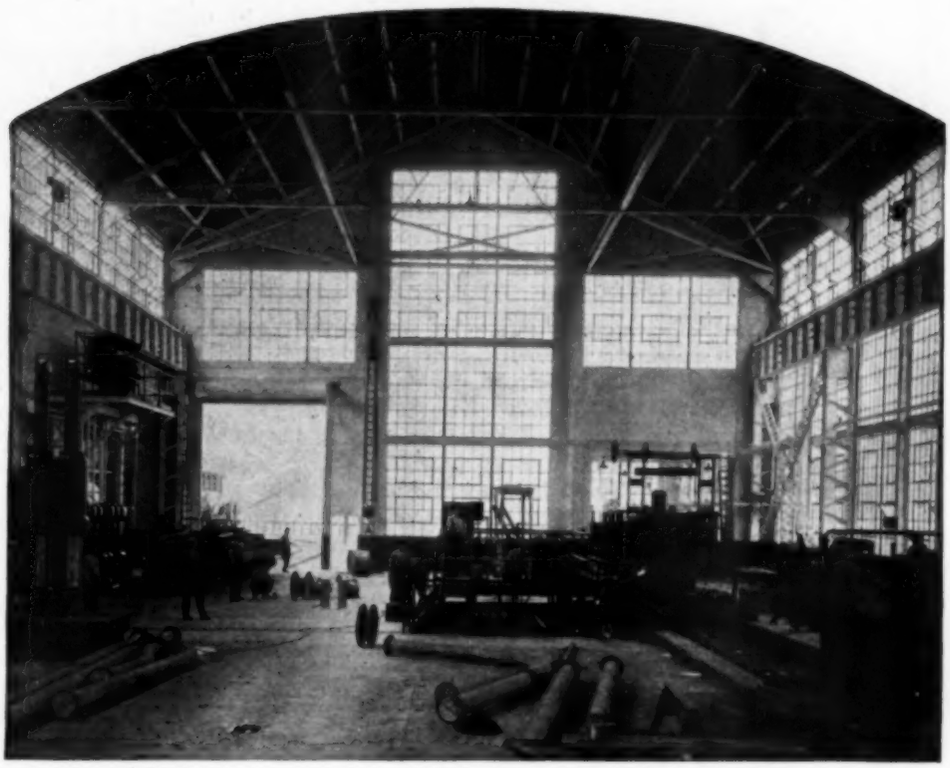
Cracks finally developed around the tube between the annealed areas entirely through the remaining metal. As this indicated that the stresses between the carburized layer and the tough back had been relieved, it was considered safe to burn through the remaining inch or so of metal in order to expedite completion of the job. This was accomplished by an oxy-acetylene torch in about an hour after the boring bar had been removed. The cylindrical section removed weighed about 48 tons.

The curves in Fig. 5 show graphically a comparison of the performance of the various high-speed tool steels and the tungsten-carbide. As the data from which these curves were plotted was not obtained with laboratory accuracy, the curves of "Amount of metal removed per hour" should be considered as merely comparative. The rate of removing metal decreased slowly through the first 8 in. of penetration. Then the hardening effect of the carburizing began to be noticed and lighter cuts had to be taken. At a depth of eleven inches, the use of the tungsten-carbide tools began, resulting in an abrupt increase of performance. This was rapidly reduced, however, as the metal became exceedingly hard and the conditions under which the tool had to operate were increasingly difficult. Finally the cutting rate became fairly steady at about 30 cubic inches per hour, and it appeared that this rate could have been maintained to the end. If the machine had been able to drive the tool with less chattering a much better performance would have resulted.

Work was carried on by continuous shifts except on Saturday afternoons and Sundays. The first cut was made on July 15, 1929, and the upper section was removed on August 12th. 388 out of 530 hours were spent in actual cutting during which time 32,667 cubic inches of metal were removed, weighing about 4½ tons.

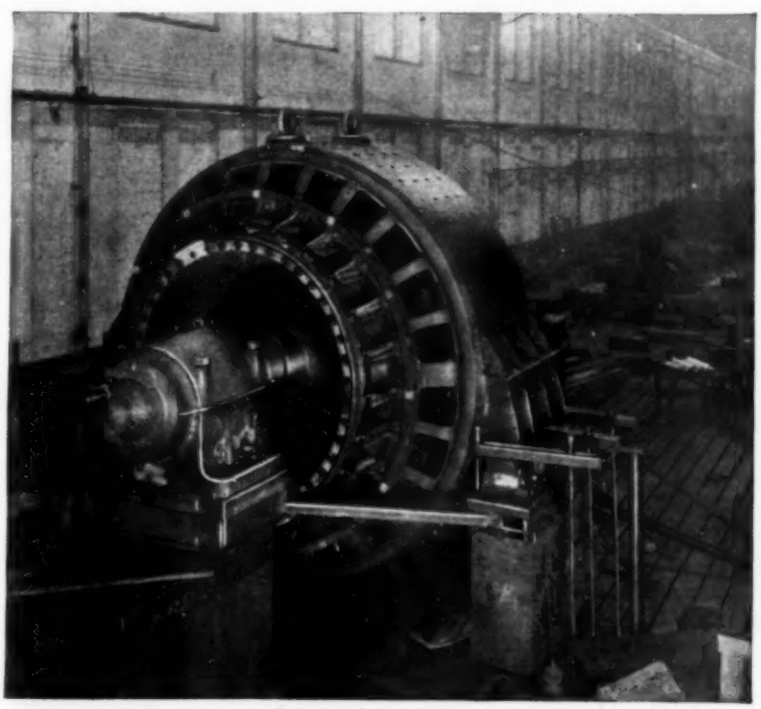
It was unfortunate that the necessity for speeding the completion of the job prevented completely finishing the cut. The general conclusion can be drawn, however, that when the necessity for doing such a job arises, tungsten-carbide tools can be relied upon to cut through face-hardened steel. It is, of course, most desirable that the tool be held in a rigid tool holder, in a powerful machine that will permit light cuts at high speed. The remarkable part of the job just described, however, is that tools made with brazed-on tungsten-carbide tips will work under conditions of vibration, chattering, and shock, in metal so hard that the ordinary run of tool steels will fail. At the present time the great expense of the tools will limit their use to jobs where the initial tool cost is immaterial compared to other requirements.

Fabrication Shop for LARGE-SCALE WELDING



A SHOP, planned especially for the fabrication of parts prior to welding them, has been built by the Westinghouse Electric & Manufacturing Company, at East Pittsburgh. Its dimensions are 75 ft. wide, 170 ft. long, and 40 ft. high. The building itself is largely of welded construction.

The equipment of this shop is complete for the purpose intended. Heavy rolls and hydraulic forming presses shape the various pieces that are used in the making of welded machinery. The parts now being constructed by this method, include motor and generator frames, end plates, turbine casings, and other equally important parts.



The frame of this 7,000-hp. motor, built for use on a reversing mill in a large steel plant, is an example of the work that has been done in the fabrication shop. The frame of this motor weighed approximately 60 tons, being made up of four steel slabs, 9 in. thick, 30 in. wide, and over 30 ft. in length.

The slabs were heated and rolled to shape, the mating sides were machined and then welded together longitudinally in pairs. The flanges and feet were added, and machined afterward. The halves were bolted together and the completed frame was machined for the pole pieces and end plates.

The savings in patterns and in molding costs are considerable factors in work of this size, and with this construction, work can be scheduled with certainty, there being little probability of failure.

In addition to this, the electrical characteristics of the motor are improved because of the absence of porosity and blow holes.

Photographs by courtesy of the Westinghouse Electric & Manufacturing Company

EXECUTIVE · FORUM

Should Estimates Be Given Operatives?

THE December cost figures were spread in neat rows on the desk of John R. Giddings, of Henderson, Giddings & Barker, Inc., machinery builders. As in many another company, the cost department had prepared a monthly analysis for the president, comparing the actual cost with the estimated cost of every special job. Though the figures were tinged with accusing red, the atmosphere of Mr. Gidding's office was unquestionably of another color.

"Bert," he challenged the chief estimator, "Your figures call for a factory cost of 4,650 dollars on that lot of finished, semi-steel flywheels for Ruppert Diesel. Actual cost shows just under 6,000. How do you account for that? It can't be the foundry this time, because their loss report was never lower. You'll have to find a new alibi."

"But it was the foundry," said Bert, bristling. "Partly the foundry, anyway. I estimated that those wheels were just the size to sweep in the floor, as we did that other lot. Those dumb Doras out there went to work and made special flasks and a special pattern for the job. Of course those things don't cost anything. Then—"

"Then what?"

"Then the machine shop finishes them on that old, broken-down, No. 16 boring mill, using about 40-ft. speed and ⅛-in. feed, when I know darn well that the new No. 127 was open, and we could have cut the finishing time almost in half. Believe me, I've looked into that job."

"How about it, Joe? How about it, Ed?" said Giddings to the foundry superintendent and to the machine shop superintendent.

As if they had rehearsed their lines together for a play, they answered in unison, "But, how in thunder did we know *how* Bert figured the job?"

"We've begged and pleaded for cost estimates in the shop," continued Joe.

"And you've been telling us right along that if we were given the cost estimates we'd follow Bert's plans, and we'd have no chance to use our ingenuity in turning out the stuff," added Ed. "That's fine when work is slack and we've got time, but you know what December was like—what with trying to make a record year's billing."

"Let me break into this session," said a quiet voice from the door. "I just happened in, and I've heard pretty much all you've said. I'd like to suggest that you go another step farther than Joe and Ed suggest. May I come in?"

"Yes indeed, Bill," said Giddings to his friend William Holland, the industrial adviser, "The boys have got me in a corner, and it looks like I may have to take the count. What further step do you suggest?"

"Since you're inviting it on yourself, I say to subdivide every cost estimate and give each actual operative the part of the estimate that covers his work. I'll grant in advance that this procedure is unorthodox, and possibly unusual; but if you have the right kind of men in your shops, and I have reason to believe you have, you will not be betraying any state secrets. Many a man will work out ways and means to show up Bert's planning, and that certainly will be all to the good. The procedure does not always work, but it is worth trying."

What Do You Think About This Executive Problem?

In many a plant like Henderson, Giddings & Barker, there seems to be a tradition that operatives should not see cost estimates. What is your own slant on the subject?

Do you believe that cost estimates should be given the operatives? What are the advantages? The disadvantages?

What has been your own personal experience in the handling of similar problems?

The *American Machinist* invites you to write in your analysis and findings for publication.

DISCUSSION

OF PREVIOUS PROBLEMS

Equipment Replacement in Slack Periods

Wall Street fluctations in reality affect only those whose poor judgment caused them losses. Their judgment can be expected to be as inconsistent as their sporting blood.

When they win, they act very modestly, but the company which issued stock they played does not gain anything; when they lose, though the company does not lose anything, they become very dejected, and make all who come in contact with them listen to wisdom.

The fact that cash reserves are high, order books are filled, far-seeing directors are in favor of the move, and, more important than anything else, "machinery is obsolete" should over-rule the personal disturbances of a few. If all companies would wait to see what the trend of business is going to be, there would be no business at all. Some one must start and keep the ball rolling.

After all it is not the gambler's losses, or the failing of a company or two, that causes hard times. When the buying public stops buying, the merchant cannot order; without orders, the manufacturer cannot employ. Let the world know that you have money and that it is going to be spent. You are going to order equipment and materials, your suppliers in turn are going to have to order, and the result will be felt all the way down the line.

—W. E. FISCHER, *Tool Room Foreman, Bonney Forge & Tool Company.*

What Should We Teach Apprentices?

We are falling into the error that the schools make in our consideration of the problem of apprentice training. After all, no single subject can be covered so thoroughly in a course that the student can learn nothing more about it. We are prone continually to add subjects, taught too often in a way that emphasizes three reasons for this and five for that, on the assumption that, if the student memorizes these reasons, all will be well. On the contrary, greater emphasis should be placed on cultivating powers of observation, analysis, and discovery of facts.

To accomplish this purpose, we should encourage the apprentice to cultivate certain habits. For example, he should read technical magazines not overlooking their advertising pages. He should then be drawn into discussions about some new machine, or some new way of doing a job, that has been published in one of the journals. If he asks questions that are answered in reference books, he should be encouraged to visit the library and look the answers up. He should be given opportunity, occasionally, to visit neighboring plants and to discuss with men in his own organization the methods and equipment he sees there. This plan will assist him in developing the habit of observation.

When some unusual job or set-up has been successfully developed in his own shop, he should be given an opportunity not merely to hear about it, but also to investigate it and to gain some idea of the problem to be solved and the methods employed to solve it. Throughout his entire course he should be trained along lines that place the major emphasis on the cultivation of habits of observation, resourcefulness, analysis, self-help, and clear thinking. We can never teach all the facts regarding any one subject, since new discoveries are being made daily in every line of industrial activity. But we can encourage basic habits that will be useful and applicable under any circumstances —JAMES H. STEVENSON,

Chief Planner and Estimator, Naval Aircraft Factory, Philadelphia Yard.

Will It Pay to Enlarge the Plant?

The smaller companies usually have more difficulty in deciding this question than the larger organizations, for the simple reason that the information upon which to base their conclusions is either lacking or unreliable. One of my clients was confronted with this problem last year, and I discovered that they had had various "spasms" to enlarge the plant for several years, but had recovered each time when busines fell off.

However, as the business had practically doubled during that period it began to look as though something ought to be done about it. They were doing a business of about a million and a half a year, and their sales mounted steadily through 1928 and 1929. The company was very conservative, and entirely owned by one family. I mention the latter fact because it had some bearing on their difficulties. I discussed the matter with the General Manager, who had originally been a salesman for the company. He knew the business very well from that angle, but admitted he knew practically nothing about manufacturing, which was all left to the Superintendent, who had grown up with the company, and was a nephew of the owner.

A survey disclosed that a proper layout of the equipment was of the first importance, and further analysis resulted in equipment being scrapped, equipment which should have been replaced several years ago. A miscellaneous assortment of wooden shelving, that passed for a stock room, using about six feet of height on a floor with a ceiling height of fourteen feet, was replaced with steel shelving twelve feet high.

In the basement, which was the press department, the headroom was barely sufficient for the presses; consequently, the line shafts and the line of belts to the machines took up more actual space than the machines themselves. Individual motors for the machines made this space available, and also made possible a better arrangement of the machines.

By planning the production we cut the in-

ventory in two; redesigning many of the parts either eliminated them or combined one or more operations. As most of this work was press work, we were often able to show an actual labor saving of 75 per cent, due to the combination of operations, and also a large saving in material.

The result of our efforts made about 30 per cent of the entire manufacturing space available for expansion. It is the writer's opinion that many companies should avail themselves of the services of an industrial engineer occasionally, "to boil down" their manufacturing processes and increase the facilities by following the methods outlined above.

If, however, in the case cited, the plant is sufficiently well organized to be considered out of the class referred to above, it is highly probable that a sales analysis would furnish the answer to the question. Such an analysis should be very thorough, and should answer the following questions.

1. Is there a trend in favor of equipment having a different principle than the machines we manufacture?
2. Are we covering the territory thoroughly?
3. What are the prospects of continued activity in our customers' plants?
4. What is the total of "old customers'" accounts lost over several years?
5. What is the total of business taken from competitors which they might consider as being taken from old customers over the same period?
6. What is the total new business (not taken from competitors) over the same period?
7. What are the reasons for loss of orders to competitors in each instance? Classify under design, price, delivery, and service.

There will be plenty of food for thought in such an analysis. In addition to answering the questions it will bring to light weaknesses in your organization that you are not aware of. The question of enlarging the plant is a matter that cannot be guessed at, and all of the matters above referred to are part and parcel of such a question. More than once I have seen such a question resolve itself into "or should we relocate our plant?" This question has assumed more importance since the advent of the automobile, which has made many smaller cities ideal for manufacturing. Any manufacturer about to build should give full consideration to this point before deciding. —WILLIAM E. HAMILTON, *Industrial Engineer, Evanston, Illinois.*

Friendliness in Business

I have nearly always found that friendliness with the seller pays. How can one be anything other than friendly with a man who is out to give you the best value for your money? If he is not out to do that, why deal with him? Why not buy from someone who is? I always feel uncomfortable when buying from a man who "protesteth overmuch," and usually have to spend more time than I really have to spare keeping him up to his promises. If a man lets me down deliberately, or tries to put a fast one over on me, I never bother with him again.

Nevertheless, I quite agree with Armstrong, if by "friendliness" between buyer and vendor, he refers to acceptance on the part of the buyer of all the presents—alcoholic and otherwise—which the high pressure salesman likes to give him. The vendor is sure to get his money back with interest, and Armstrong eventually has to foot the bill. —H. J. BURNHAM.

The Night Shift

For several years I had charge of the night shift of a large concern manufacturing a seasonal confection. We used a great many packing and wrapping machines. These machines were large, and adjustments had to be made with considerable care. We usually split the adjusting gang in halves and work in two shifts, alternating every two weeks between day and night work. The same plan was followed with the machinists.

The night work lasted for about three months each summer. The men received 10 per cent more pay on night work, worked fifteen hours each night for five nights a week, and were relieved at the end of the two-week period. This schedule was successful with the mechanics. We employed, however, a regular night crew for unskilled labor, and the turnover was considerable.

—WILLIAM SCHIRMER.

Does a Highly Developed System Pay?

Most emphatically, yes. Why? Because "System" is the machine tool of commerce. No wonder the air in John Hardy's office got hot. Here we have a magnificent organization, scientifically planned for producing "the goods," and their efforts to retain the patronage of a new firm, who have entrusted them with a large trial order with a time limit, are "scotched" by sheer lack of foresight.

If a thoroughly trained engineer had been the progress clerk, instructed by the executive to grip the job from start to finish, with power enough at his elbow to advise and eliminate every emergency in a diplomatic way, it would have been impossible for such a sequence of mishaps to occur. Moreover, our friend, Holland, was right when he said that the fine details could have been waived. It is presumed that each departmental manager knows his job, and there is no excuse whatever for not giving such an urgent job special consideration.

Highly developed systems do pay, and it is the superintendent's job to see that every unit is working in unison, like the mechanism of a chronometer. He is the regulator. It is fortunate that Hardy's failure to deliver the goods was overlooked, for it isn't always the case.

—T. W. HOBBS, *Birmingham, England.*

Selecting the Type of WELDING for the Job

By T. H. Booth
Engineer, Buffalo Forge Company

Fig. 1—Welding a sheet-metal fan outlet with an oxy-acetylene torch. While this method of welding is not as rapid as some of the others, distortion of the work is under better control

WELDING is becoming more important as a production operation in the manufacture of machine equipment, and as with nearly all processes, no one method seems to give the best results on every kind of work. Some excellent examples of the selection of different methods of welding to suit a varied product are to be found in the plant of the Buffalo Forge Company, five methods being used, each in the place where it has been found to give the best results. The methods in use are oxy-acetylene, alternating-current arc, direct-current arc, spot, and butt welding.

In determining the type of welding, consideration is given to the requirements of the work, such as its weight, the quantity to be welded and the desired appearance of the weld after completion. Oxy-acetylene welding is done on many lots where the quantity is small. It is not as rapid as some of the other methods and is not, therefore, as well suited to quantity production. Distortion can, however, be controlled better than by some of the other methods. An example of this type of welding can be seen in Fig. 1. An adapter for a fan outlet is being welded with a steel filler-rod.

Arc welding by alternating current was formerly done to some extent, but it has now been largely replaced by the direct-current arc. The alternating arc is still used in emergency work because the outfit is more readily portable than the direct-current apparatus, and because it is possible to do a satisfactory job with it on gray-iron castings at a reasonable speed. As a production method, however, the direct-current arc has been found more satisfactory. It is easier to handle, as well as being faster on the class of work done in this shop.

The direct-current metallic arc is used in such sheet-metal work as that shown in Fig. 2. A helper "tacks" the pieces together and the welder follows, making a continuous weld. This job is a casing for a multiple-fan heating unit. The pressed-steel parts on the inside are held in a skeleton-framework jig that positions the various portions while they are being "tacked" all around. The use of paneling and flanges is an aid in welding, and increases strength and stiffness. Welding, in the case shown in Fig. 2, eliminates 600 bolts and rivets.

Another example of direct-current arc welding can be seen in Fig. 3, where the cast-steel throat filler is being welded to the armor-plate sides that make up the frame of the combined punch, shear, and bar cutter. The openings in the side plates have been cut out previously with a gas torch. This method of construction permits the members to be effectually welded into a solid unit. Welding rods as large as $\frac{1}{2}$ in. in diameter, and a current of 400 amp. are used on this job.

Comparison of results obtained by the old and the new methods is best shown in Figs. 4 and 5. Fig. 4 illustrates the old method of assembling the side plates with throat fillers and spacers. This construction necessitates many accurately-spaced holes and well-fitted bolts for holding the parts together. The absence of bolts and nuts in the machine shown in Fig. 5 makes a much better looking job, besides making the machine much stronger and cheaper to build. The frames in welded machines are so much stiffer that deflection has

Fig. 2 — Direct-current metallic-arc welding a large fan casing for unit heaters. Here the helper is "tacking" the parts together. The welder will follow, making the weld continuous

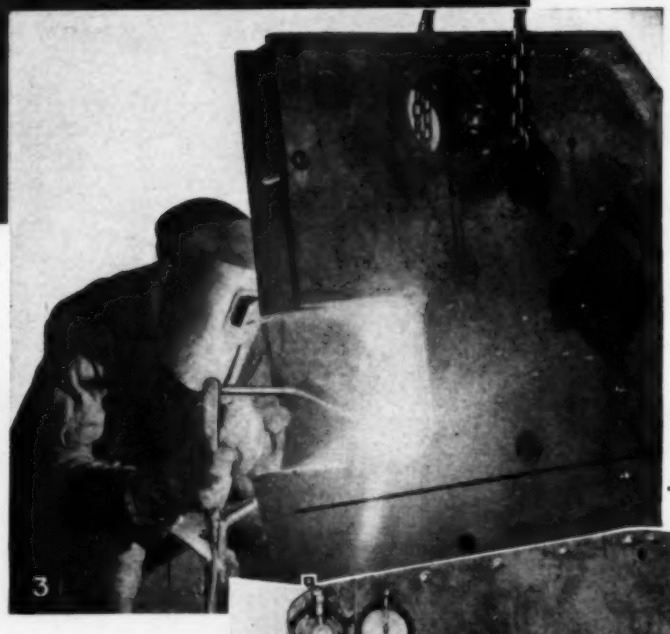
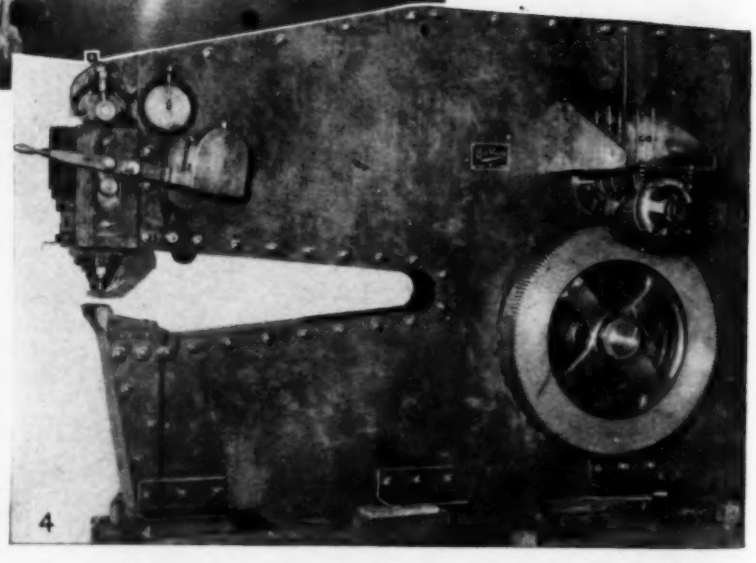


Fig. 3 — Arc-welding the frame of a punch, the sides of which are built up of armor plate. Cast-steel filler blocks are used for spacing. The openings in the side plates were previously cut out by a gas torch

Fig. 4—Old method of assembling frames, using bolts, nuts, fillers, and spacers. The bolt holes must be accurately spaced, and bolts must be well fitted. Otherwise, the parts will not be properly located



been reduced 50 per cent in some cases without any added material.

In one case, welding has been carried a step beyond the frame of the machine, and the main gear has been built up, as shown in Fig. 6. The rim of the gear is made from 1¼x3-in. steel, rolled to shape, and the ends welded. The spokes are of I-beam section, and are welded to both the hub and the rim.

Where joints can be made by lapping over the edges of sheet metal, as in Fig. 7, the spot welder, operated by foot power, makes a neat job. This type of welder can be operated so rapidly that the welds are made at very low cost and are permanent when the voltage and amperage are properly regulated.

Butt welding also has its place in many manufacturing operations. This method gives a complete weld of the cross-section in contact, with very little flash. A butt-welding machine is shown in Fig. 8. It is joining the 45-deg. mitered corners of a good-sized frame. The angular supports at each side make it easy to locate the pieces in the welding clamps. Pressure is applied by the lever at the right. The small amount of flash to be ground off adds to the economy of the operation. In this case, the flashes at the four joints can be ground off in less than two minutes.

Work of this kind requires special jaws and fixtures

Fig. 5—Appearance of a welded frame where bolts are used for the removable parts only. Not only is a machine with a welded frame stiffer and stronger than one with a bolted frame, but it is much neater

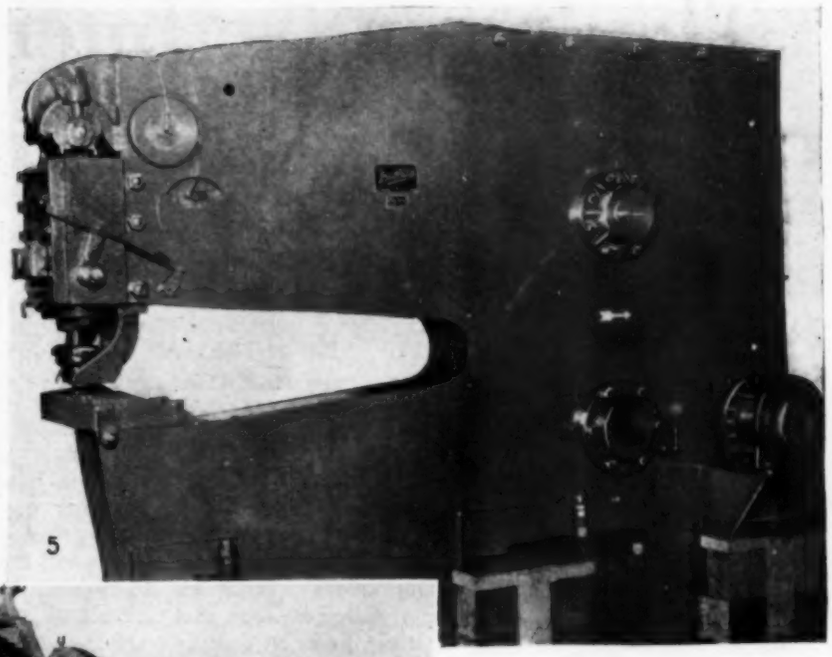


Fig. 6—Punch with a built-up main gear. The rim is bent into a circle, and welded. The spokes are of I-beam section, and are welded to both the rim and the hub

Fig. 8—Butt-welder with fixtures for welding the mitered corners of a steel frame. Butt-welding gives a complete weld of the cross-section in contact. The flash formed is very small, and is easily removed by grinding

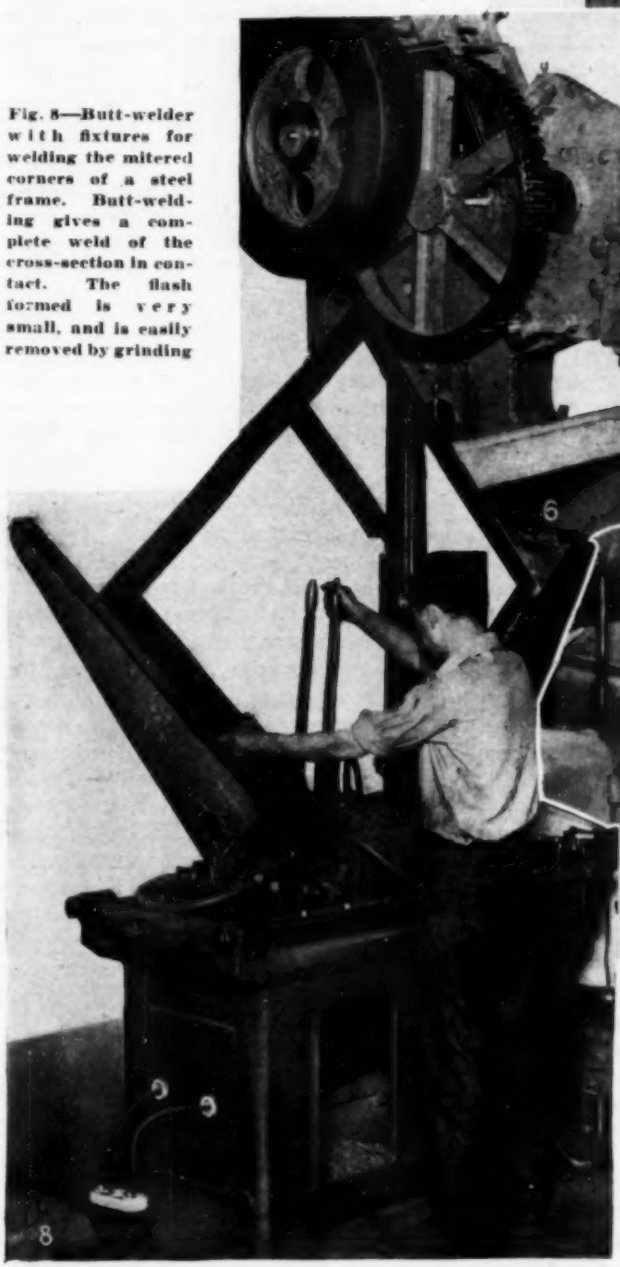
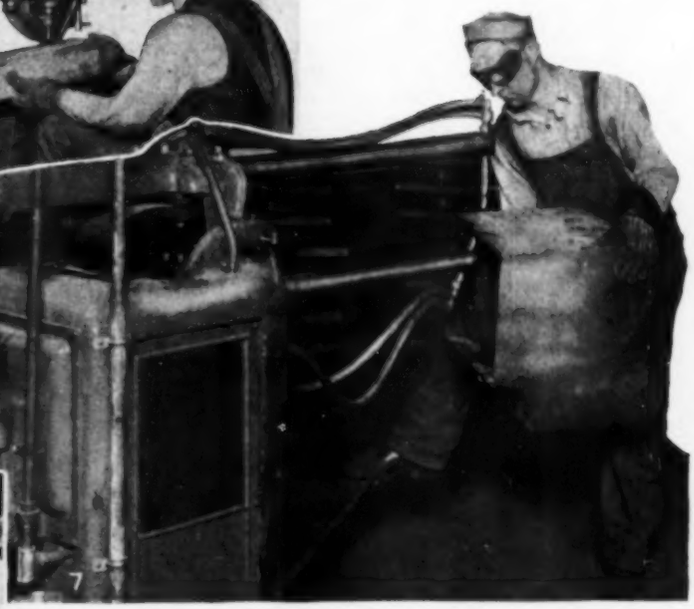


Fig. 7 — Spot-welding a sheet-metal heater outlet. This type of welder can be operated rapidly, and the welds can be made at a very low cost. To make them permanent, the current must be properly controlled



as well as a large amount of current. The cost of accessories must be taken into consideration when deciding upon the method to be employed. These factors limit the use of butt welding to work of a quantity large enough to warrant the initial expense involved.

Selecting a welding method may be governed by its portability, though sometimes, the trailing of hose and wires across the floor is decidedly objectionable. Both gas and current have their drawbacks, but one can be remedied by piping, and the other by a portable resistance box.

The Executive Interest in Costs

Cost information and facts when properly prepared and presented are invaluable tools for the executive. The chief executive of any business must have them. The nature and use of some of those tools and the actual needs therefor should be carefully considered

By THOMAS B. FRANK
Treasurer, The Cincinnati Planer Company

THE EXECUTIVE is interested primarily in profits, and secondarily, in how those profits are derived. How, then, can he insure himself that every department, every operation, every function in his business establishment contributes to that profit? Since, commonly enough, and normally, some of these functions contribute apparent losses to the final figure he sees as a result of business operations, he must know definitely what losses exist and where. He must know definitely the whys and wherefores of those elements that must be deducted from the net profits that the business should earn.

All business within the classification of machine shops and metal working shops may be said to be established for one purpose, divided into two very distinct and separate functions, manufacturing and selling. All costs of carrying on those two functions must be known and considered by the managing executive. Lack of such information is very costly.

Any such lack of information is chargeable to the executive himself when he clings to any time-worn accounting traditions. Modern successful business has proved that the accounting and costing functions within a business are not just "necessary evils." The really progressive and successful manager of today knows that that which was right last year is probably wrong today. Modern business is so controlled by economic laws that the business man of today cannot possibly ignore those laws in endeavoring to guide the destinies of his business. It is vital that accounting information be based on current present-day facts and not on the ancient-history fiction of pre-war figures.

Colonel L. H. Morse of Boston aptly called this to the attention of business men when he said, "Modern business tools are being invented and forged by the keenest minds in great numbers, and it behooves the executive to make a daily study of the field to see if some new business tool has not come on the market with which he can produce greater net profits on his business as it stands, or additional profits from business which he should properly reach out for. Modern cost accounting is one of the keenest, most effective of modern business tools and more than that, it is the one which is absolutely indispensable."

Before starting to use the business tool of modern cost accounting, the executive must satisfy himself that the tool is sharp, of the proper shape, size, and material. "Effort spent on incorrect costs is a complete loss," according to the slogan adopted by the National Machine Tool Builders' Association. Likewise it might be said that effort spent on the part of the executive in the use of incorrect cost figures is a complete loss. More than that, it is not only a complete loss of the time spent using it, but it can and does result in many larger losses in other ways, and sometimes in the loss of substantial values to stockholders, and to the public, through receiverships and failures.

Sharp, accurate, and effective production tools are the result of scientific research and study, accurate design, quality workmanship, and the use of first-class materials. So it is with the tools of management.

The tool of cost accounting must have the following attributes if it is to be effective:

1. It must be based on scientific study and research of the problems in the industry of which the business is a part.
2. It must be based on facts and conditions pertaining to the particular and individual business to which it is to be applied.
3. It must be worked out and applied by a craftsman familiar with all of the finer points of his accounting craft. He must have a broad-minded view of the economics of business, and a definite knowledge of how to apply them.
4. It must be so designed that modern methods are used, methods that have been the result of years of development and progression.

ONE of the country's leading economists recently made this statement, significant of the trend of thought regarding the importance of accounting: "Forced accounting has probably been the greatest factor in bringing about and prolonging the present period of prosperity." By forced accounting he meant the accounting that the income tax laws forced on business. It means that business has been forced into the use of certain tools for the measurement of its activities. While there is no denying that the results have been greatly beneficial to business as a whole, yet improperly designed and improperly functioning systems of accounting have contributed to the downfall of many businesses. The greater responsibility of accountancy is a challenge to all accountants.

The executive who has at his command up-to-the-minute facts regarding the various phases of his business can unhesitatingly make proper decisions that result in the utmost of performance and value to his company. Without such information how can his decisions be anything but guesses? Judgment can carry along for a while, but facts rule. All of the inaccuracies or misstatements of fact in balance sheets and profit and loss statements arise directly or indirectly from the cost accounts.

Accountants have been slow to accept new methods, both in the revision of forms used for gathering and recording information, and in the application of new ideas. Only recently have they accepted and considered

the "standard cost" idea, "interest and replacement values," etc. The executive has been crying for information such as the modern standard cost plans make available. Historical costs can serve but one purpose, to record past performances for Income Tax purposes. He must have information that deals with the present, today, presented in terms of today's values, and with tomorrow's probable values as well. Competitive marketing, and other economic conditions make it imperative that he know, with no "ifs and ands," just what he is accomplishing currently, and what, under a given set of conditions, he can expect to accomplish in the future. Such conditions can be forecast, and the results applied, through "budgetary control."

Control is necessary in order to regulate profits and stop losses of investments in inventory. Modern practice includes comprehensive inventory records and controls. They make readily available information as to quantities on hand, quantities required, values, designs, weights, materials, usability, market changes, and other important information. They also record data pertaining to production, and they should record comparative costs as well. The value of such records is obvious.

PROPERTY accounting has received an unusual amount of attention in recent months. It is just as important to account accurately for units of physical property as it is to account for cash in the cash-drawer. The changes in value, and the economic effect of such changes upon the condition of the business, make comprehensive records of all units of property extremely valuable. Accurate costs of production cannot be ascertained without such records. Depreciation, which is such an important element of cost, cannot be based intelligently without property records properly departmentalized. Details of investments are necessary to a proper control of plant investment and the resulting effect, through depreciation accounts, on costs.

Too little thought has been given to the proper distribution of engineering department costs in machine shops. Modern accounting methods segregate such expenses from other shop expenses, and set them up as a distinct classification. Certainly such information is of inestimable value to the chief executive of a business in determining selling prices, the practicability of experimental work and new design. Through such records exact costs of development of all kinds are readily available, and the old familiar "patterns and drawings" accounts take on a new significance and really mean something.

Methods of distributing overhead or burden have been considered for many years. Many methods have been evolved, each succeeding one a trifle better than its antecedent. Now, we have the "production center" or "machine hour" rate. By the application and use of such a method, the cost of producing a given piece of equipment, on a particular machine or in a given center of production, can be determined very accurately. How obviously more efficient executive action can be when based upon this sort of information.

The cost to a business of a large investment in plant and equipment is an element of production cost generally ignored or improperly interpreted. "Interest as an element of cost" has been frowned upon for many years by accountants, principally because it departed from traditionally conservative practices. Economists, however, and a large number of wide-awake men, know it exists and must be reckoned with. In present-day competitive markets and under current economic conditions, business cannot hope to make progress unless cost information provides figures comparable with those of other competing concerns. Interest is indispensable as an element of cost when establishing selling prices. When interest is included as an element of cost at all times, executives can much more intelligently decide between profitable and unprofitable business transactions.

WASTE and spoilage are elements of loss that assume large proportions. Spoilage causes, while generally known, are never definitely known without scientific accounting control. In recent months much has been accomplished by the larger corporations in reducing this element of expense. The largest contributing factor toward its reduction has been the work of the accountant. Proper analysis, segregating the dollar amount of those losses by causes, is invaluable.

There are two very different and distinct methods of determining costs. One method determines what a product has cost after it has been completed; the other contemplates the cost and determines it before the work is done. The details of such systems need not be mentioned here, other than to state that the effort spent on predetermined costs is no greater in most instances than that spent on historical costs. Regardless of the effort involved, it goes without explanation which of the two methods is the more valuable to management. With the predetermined cost, or "standard cost" method, all deviations from forecasted results can be shown immediately, and the necessary action taken to correct them. Under the historical "actual cost" or "job cost" method, it is almost useless to determine accurately and quickly what caused increases or decreases from previous performances, assuming that previous performances themselves were correct. "Standard costs" force the executive to concentrate his attention, and his resulting action, on the very things that need attention; they eliminate unessentials.

More recently, attention has been given to the costs of marketing and distribution. Little has been available, in the past, to give the executive scientific information as to just what it cost to sell certain products by certain methods, and in certain territories. Some of the larger corporations have been gathering this sort of information and allocating costs by products, with the result that selling and distribution methods are improved, and selling costs reduced. All this means increased profits.

One of the most outstanding developments in recent years has been the spread of uniform accounting methods. Only recently the National Machine Tool Builders' Association has adopted a uniform plan that is fast being accepted as a standard not only by their own members, but by other similar industries. The many benefits to be derived from the individual adoption of uniform methods are self evident and a matter of record. The managing executive of any business who knows that the cost figures on his desk are made up in the same manner as those of his competitors, can be assured that they are acting intelligently and making decisions with all cards on the table. They are not fooling themselves, their competitors, or their industry. Such methods make for healthier conditions, better business relationships, and larger earnings. Executives, accountants, and workers alike benefit from such programs, and all should cooperate to bring about their wholehearted adoption. Executive interest in costs must ever grow more keen.

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions given at the foot of the page have been prepared

THE · FOREMAN'S

Too Much Co-operation

ON THE way home, Al started the ball rolling, as usual, by exaggerating something he had heard during the day. "What's this I hear about you and your new straw boss staging a battle right in the department? Is it your idea that Williams appointed him just for you to fight with?"

"Who said I was fighting with him? It's a darn lie, whoever said it. Williams appointed him to help get work out of my department, not the other fellow's; and I told him, loudly and firmly, that I would like him to expend more of his energies on his own work."

"What's the matter, don't you believe in co-operation any more? You used to be one of its high priests."

"Sure I do, but I'll do all the co-operating for my department. Co-operation looks different to me when I see my assistant putting in most of his time helping out other people, while I am being 'called' for not getting my orders out on time."

"I see, as some wise man said a long time ago, it makes a lot of difference whose bull is gored. Usually the great boosters for co-operation are not those who must do the co-op'ing but those foremen who can't keep up, and those executives who are willing to impose upon a willing foreman in order to help a poor one get by."

"Isn't that rather strong language, fellow?"

"It may be. But it is a self-evident fact that if every one carried his own part of the production burden, co-operation would be unnecessary, and co-ordination would take its place."

"What's the difference between the two, wise boy? I have been the victim of both those things without knowing which was which."

"The difference is between receiving material on schedule, machining it promptly, and delivering it to the next operation on time, or helping some one else to rectify their mistakes, while your own work lags behind. If your work doesn't lag, you have too many men."

"That's just what I am kicking about. If there is going to be any more co-operating, I am going to do it myself, and I am going to be hard boiled about it, too."

"Don't go to the other extreme, big boy. We all need help at times."

"Yes, I know, but I won't be the fall guy any more. I believe in people taking care of their own kids before they start doing welfare work. My men and my assistants are all working for me, and I am going to help the guy that my work goes to, not the one it comes from. By the way, Al, can you lend me a couple of drill press hands tomorrow?"

Does the average executive co-ordinate, or merely arbitrate? Can the average man be a good fellow, and a good foreman at the same time?

Idea suggested by Harry Kaufman.

All foremen are urged to discuss these questions vital to their work; of course the

ROUND · TABLE

DISCUSSION OF EARLIER TOPICS

What You Do or What You Get Done

A COMMON trait among foremen is to try to do too much. This tendency is the result of a subconscious feeling that if they do the work themselves, it is properly done. This idea was criticized by Williams, and I agree with him.

A foreman should not be strictly a white collar man. He should be able to do any job under his control, and should do some of them for his own good and for the effect it has on the men.

It is not necessary, or wise, to attempt a general change of men because the superintendent sees fit to call down a foreman. What the foreman should do is to let some of the better men do their work in their own way, with less directing as to details. Other men can be coached along so that they will be capable of doing at least a few jobs by themselves. A foreman then becomes a leader, and, by carefully planning his work, finds that more is being produced with less physical effort on his part.

—L. F. SWENSON, *Industrial Engineer, Perkins Machine & Gear Company.*

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Compulsory Membership in the Mutual Aid

THE improvidence of wage earners is one of the tragedies of industry. Many of them go merrily on their way with never a thought of preparing for rainy days or disability. However, it seems that many of the workmen are in favor of a Mutual Aid in the shop. When such a benefit society is established, it should be compulsory for all to join. In this way the monthly rate of dues can be made so low that none will miss it. The company should stand all costs of running the society, as it will reap benefit from its presence and activity. The men will be sure of some assistance in times of sickness, and will be relieved of considerable worry, which will help in their speedy recovery.

As is usual when a worthy reform is advocated, particularly if it will cost them a little something, a portion of the men will be inclined to rebel at the proposition. However, when a majority of the men favor such a plan, it should be put in practice. After it has been in operation for a time and they can see good results from it, their objections will not seem quite so good to them, and they will gradually come to realize that the benefits are well worth the cost.

—L. O. BROWN, *Toolroom Foreman, Holcomb & Hoke Manufacturing Company.*

Tempering General Purpose Tools

MODERN tool factories with pyrometers and automatic furnace control send instructions to the hardening room along with the job, showing the heating time, temperature, quenching medium, tempering time, and heat. In consequence, the men employed in the heat-treating department are not hardeners, but furnace operators. They produce uniform results on large lots of production tools, such as drills, taps, or reamers. But it has been my experience that an old-time toolsmith can harden general shop tools, such as chisels, scrapers, and punches, better than can a production hardening room.

The shop that has a real tool blacksmith for forging, hardening, and tempering shop tools is indeed fortunate. A good blacksmith is hard to find, and the shop that has one should treat him as an asset to the whole works and overlook his old-fashioned notions about the apparatus of the modern heat-treating department.

—H. M. DARLING, *Engineer, Wells Tap & Die Company.*

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Should the Workman Share Responsibility?

WHEN a foreman tells one of his men to drill twelve pump housings by using a jig made for another part, and then offers no further instruction to the man, the responsibility for doing a good job cannot rightly be laid on the workman. After all, what are foremen paid for, if not for supervision? If we could assign to each workman the full responsibility for the quality and quantity of work he produces, there would be little need for a foreman; a first-class errand boy could take his place.

If Ed had made sure there was a clear understanding of what was wanted, and of the method to be employed, there would probably have been no spoiled work, and Ed would not have lost his best man.

—V. C. DARBY, *Cherry-Burrell Corporation.*

*

A Bonus for the Ambitious

THE employee who begins to think about taking a correspondence course is showing evidence that he is thinking beyond the present moment. No matter what motives prompt the thought, or how exaggerated his conception of what it will do for him, the important point is to get him started. There are too many men in industry today who excel at their assigned tasks and who are passed up when promotions come, because no one believes that they have a proper educational background to swing the bigger job.

Even if the courses taken do not add to the specialized knowledge of his particular job, they do decidedly broaden the student's viewpoint, and instill in him habits of study and analysis that are bound to prove valuable. The executive who supervises the prospective student can do much toward influencing him to take those courses which will prove most valuable to him. Too often, if left to his own resources, the prospective student will select a course in some subjects entirely foreign to his past training and experience, merely because of some ro-

discussion is not limited to foremen. Letters accepted and published will be paid for

mantic glamour that attaches to it, or because the prospectus promises an immediate gain.

Financial recognition at the completion of a course is splendid, but even more so is moral support while the course is being taken. An occasional friendly word of inquiry as to progress and the nature of the course, a word or two of encouragement are mighty strong stimuli to the man who is struggling to do two jobs at once—his present job and his preparation for his future one.

—C. F. Furey, *Master Mechanic, Naval Aircraft Factory, Philadelphia.*

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Games at the Noon Hour

WHEREVER I have worked I have found that the habit of playing games during the noon hour creates a spirit of fellowship among the men. Among the younger men, we had exciting games of hand ball, disk pitching, and boxing. It afforded a good opportunity to get rid of superfluous energy which might otherwise have been expended through horse play during working hours. Where we had women operators, we found music a splendid means of relieving the monotony, as it offered them an opportunity to sing or dance. The main handicap for making proper use of this period of relaxation is the fact that, in many places, the noon rest period is only a half hour. —William Schirmer.

WHILE certain men have a greater aptitude for speed in operation, and may on that account, be able to work more quickly than their fellows who take an equally keen interest in their work, that fact does not disprove the law that monotony reduces efficiency. The true comparison is not between two different workers, but between the self same worker when interested in his job and when bored by it.

A company's interest both in the company's men and on the operative account should be to stimulate the interest of the workers with what they do. Variety within reasonable limits is found to pay. A change of work has a beneficial effect on a man's output, and recreation wisely used can be transformed into energy.

—W. R. Needham, *Engineer, Design Department, English Electric Co., Ltd.*

IT HAS been found that a man will do his best work between the hours of nine and eleven in the morning. By that time he has had time to digest his breakfast, and to forget any matters other than his work, that may have been on his mind when he started. Also, he has not been working long enough to make it seem monotonous. But as the day goes on, the worker becomes tired, and unless he does something to refresh himself, he is likely to become slow and careless. The best remedy for this is some active game during the lunch hour, something that requires plenty of thought and action, that will limber up tired muscles and bring fresh energy into the body. Of course, it is to be understood that too much excitement after eating will cause indigestion or make the player too tired. But if the games are of such a nature that overexertion is not necessary and the time not long enough for a man to tire himself, this will not occur, and the games will be found beneficial to both the worker and the production schedule. —William A. Veit.

IF THE right kind of games are played at the noon hour they are helpful in breaking the monotony of the day's work, but if the games are not arranged so as to give each department the right kind of physical or mental exercise, it would be better for everybody concerned if the men were allowed to pass the noon hour in rest.

A game of volley ball, or horse shoes, would not benefit the men who are on their feet all day, it would only tire them out. Cards or checkers would be a more fitting game for them. On the contrary, a game of cards or checkers would not benefit the men who have to sit and think all day. —W. J. Owens, *Foreman, Newport Rolling Mill Company.*

* * * *

THE · NEXT · TOPIC

"Keeping Machines on the Job"

Games at the Noon Hour

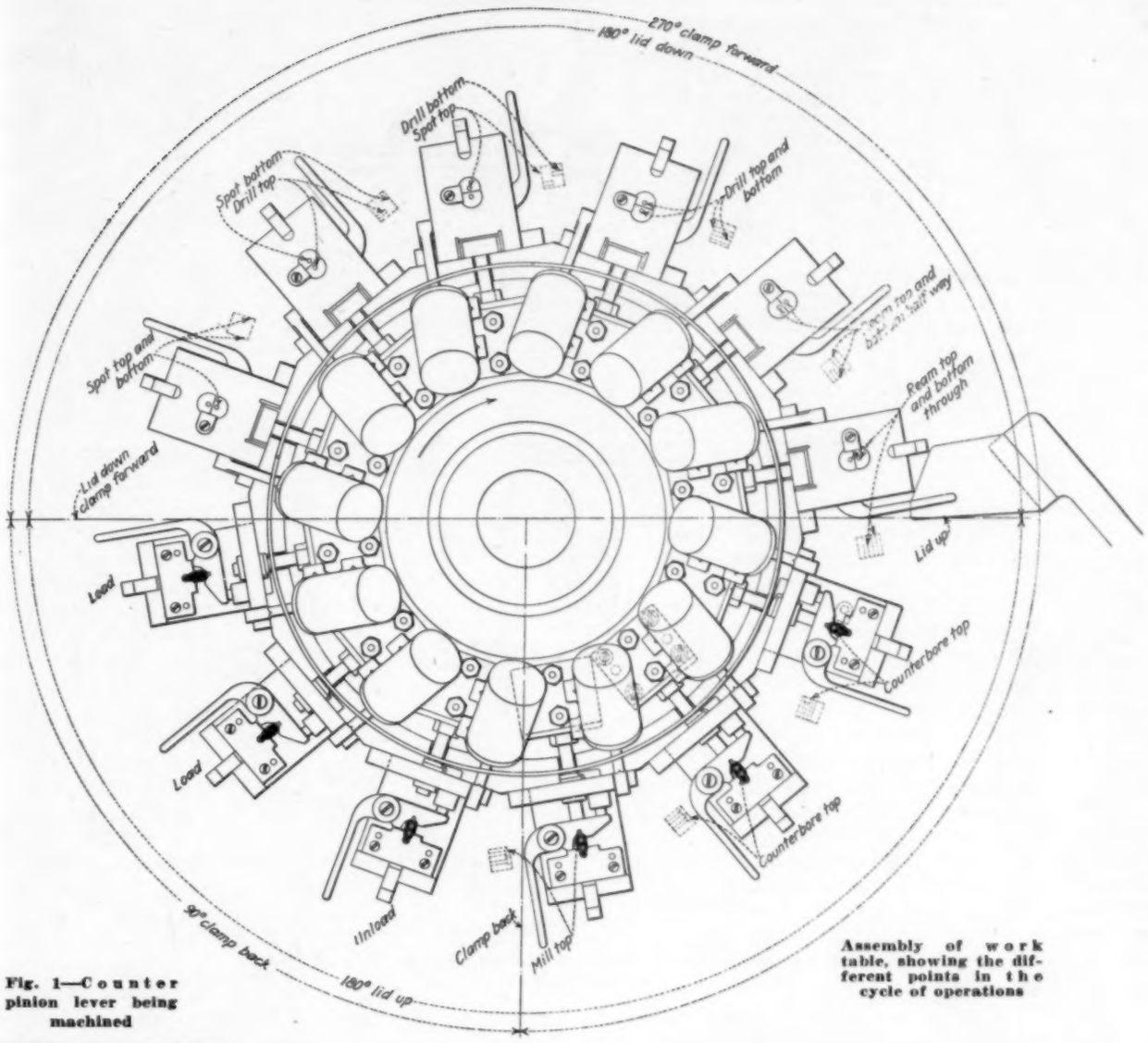
SUMMARY OF THE DISCUSSION

After a visit to several plants where noon-hour games were encouraged, Al was impressed with their value as a means of relieving the monotony of repetitive work. Ed took an opposite view, contending that the men would report late for work, and that schedules would suffer. Without waiting for Williams' approval, Al made provision for noon hour games.

IN THE discussion of this subject, it was pointed out that furnishing facilities for games at the noon hour was not a shop item, but an important executive function. This statement was based upon the contention that it is important to keep men mentally diverted during the noon hour, when they gather frequently in groups to discuss shop matters. It is at such times that the agitator, either professional or amateur, does his most effective work, and if games or other means of diversion are provided, the agitator finds trouble in securing an audience.

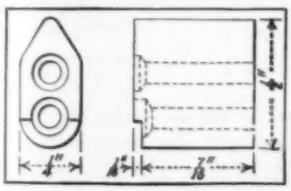
Another argument in favor of the practice was that it relieved the monotony of repetition. A man does his most effective work between the hours of nine and eleven o'clock in the forenoon. After that time his work becomes monotonous, and his mind is not on it. The games at noon revive his energy and refresh his mind.

There is little or no danger of a man tiring himself too much, as heavy physical work is no longer done by men, and, usually, the games played are sufficient only to relax the muscles. One correspondent stated that the games should be chosen with regard to the kind of work performed by the player. In no cases were games reported responsible for lateness or shirking.



Assembly of work table, showing the different points in the cycle of operations

Fig. 1—Counter pinion lever being machined



Pneumatically Actuated Drill Jigs

By R. E. McCoy

THE pneumatically actuated and controlled jigs described in this article were designed for the drilling, reaming, counterboring, and milling operations on a small part made of cold-drawn steel, known as a counter pinion liner. These parts are used for lining up the counter pinions on cash registers, and the limits to which the various operations must be held are plus or minus 0.001 inch.

The jigs are used on a specially designed semi-automatic drilling machine with a fixed capacity of 360 pieces per hour. The machine has two drillheads, the left-hand head having six spindles and the right-hand head nine. All of these spindles lie in a horizontal position. They are arranged to approach the jigs from both sides at the same time, as shown in Fig. 2, a cross section through the left-hand head.

As there is never any change in the rate at which the drills are fed up to the work or in the cutting speed or feed, the traverse of the drillheads, in which the drill spindles are mounted, is controlled by two revolving feed cams located on the main drive shaft which passes through the bed of the machine parallel to their axes. The ball bearings *A*, which are fastened to the drillheads in the manner shown in Fig. 2, act as the cam

rollers. As previously stated, the machine on which these jigs are used is a special machine for drilling this one part only, therefore a change of drill speed and feed is not necessary. The drill spindles are not all on the same radius. The speed of those on the outer radius is 1,845 r.p.m. while the spindle speed of those on the inner radius is 1,800 r.p.m. The cutting feed of all drills is 0.0015 in. per revolution.

There are twelve jigs in all, and because of the extreme accuracy to which the parts drilled in these jigs are held, it is necessary to spot, drill, and ream from both sides. To prevent chips from piling up in the jigs, and to afford better drainage for the cutting compound, the jigs are mounted on a work table keyed to a central shaft in a horizontal position.

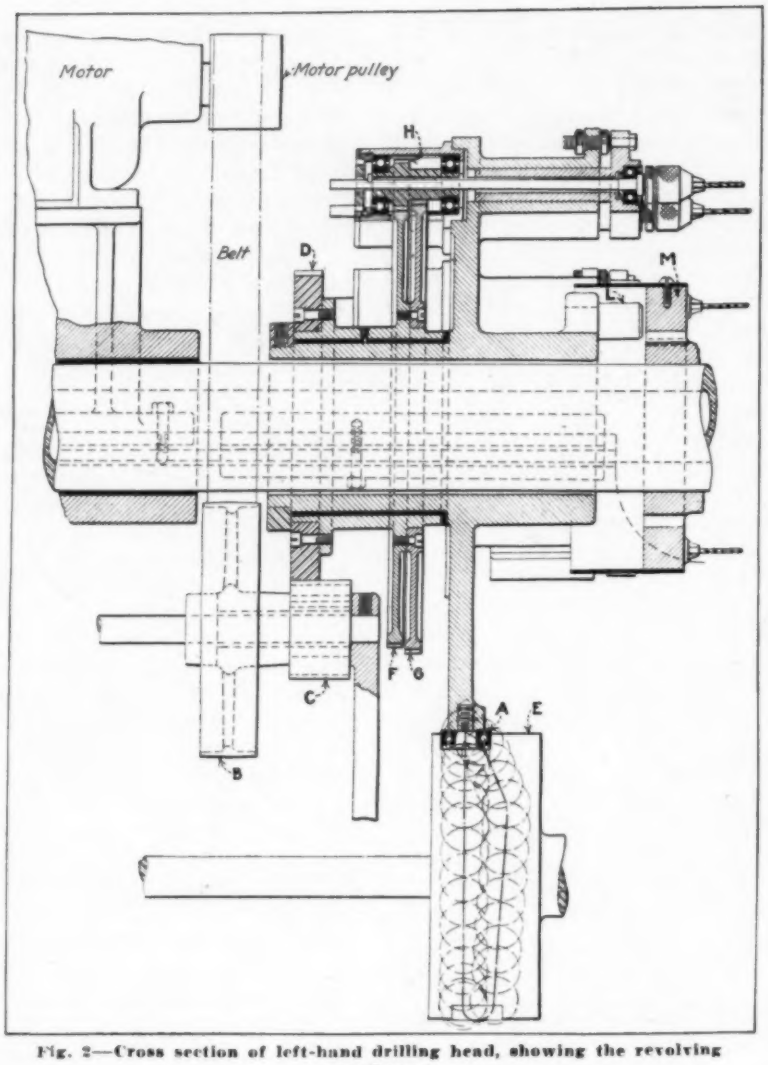


Fig. 2—Cross section of left-hand drilling head, showing the revolving cam layout

Two ½-hp. motors furnish the power for driving the drill spindles, one motor for each drillhead. They are mounted on a bracket over the main shaft bearing. This method of mounting the motors not only insures freedom from dirt and chips, but also ease of access for repairs. Fig. 2 shows the drive for the left-hand head. The drive for the right-hand head is identical. A 1½-in. belt transmits the power from the motor to the pulley *B*. This pulley has keyed to it a pinion *C* the face of which is wide enough to keep the gear *D* in mesh as the drillheads are moved forward and back by the feed cams *E*. The gear *D*, fastened to the hub of gear *F* with fillister head screws, acts as a driver for gears *F* and *G*, and these gears in turn drive the pinion *H*, which is mounted on the drill spindles.

The jigs are moved clockwise at the rate of six indexes a minute by a Geneva stop motion keyed to the main shaft. The star wheel has twelve slots to correspond to the location of each one of the twelve jigs. These are spaced so as to permit the operator to load and unload them conveniently, air being used to remove chips that might have a tendency to cling to the locating points in the jigs. As the chips are very small the light puff of air which is released in the unloading position is sufficient. No trouble is experienced from the chips flying about as they are blown off into the bed of the machine.

The jigs have a spring latch *I* for locking the lid when closed, and all parts subject to wear are made of hardened steel. The drill bushings *J* are mounted in hardened liner bushings so that when they become worn they can be replaced without impairing the accuracy of the jigs.

The work table *K*, on which the jigs are mounted, is accurately located after each indexing movement by two guide pins *L* in the left drillhead which enter two of the twelve liner bushings *M* that are evenly spaced in a circle in the work table. This insures correct alignment of the drill bushings with the drills, while they are cutting.

The air cylinders *N* and *O*, for clamping the work and opening and closing the jig lids, and the body of the valve, for controlling the air, are also mounted on the work table. Pipes from openings in the valve body *P* are connected with the air cylinders as shown in Fig. 4 and in the head piece. The pistons *Q* within the air cylinders are forced forward or back, as required, by admitting and exhausting air at the proper intervals in the cycle of operations. Fig. 4 shows the construction of this valve.

A sight feed oil lubricator is attached to the air line. This permits enough oil to be carried through the operating valve with the air to lubricate the valve properly and prevent sticking.

The body *P* of the distributing valve revolves with the work table, while the inner member *R* remains stationary. The pins *S* prevent the inner member from rotating with the work table.

The ball thrust bearing *T* and the collar *U* are secured to the main shaft. They back up the spring *V*. This spring exerts enough pressure on the inner member of the valve to take care of the wear and prevent air leakage. It also insures the proper seating of this member in the valve body at all times.

Air from the main line enters the valve through a pipe which is attached to the ring *W*, and air ports lead from this ring to the inner member of the valve that Fig. 3 shows.

As the table revolves, holes through the wall of member *R* of the valve come in line with holes through the valve body, or with channels connecting with these holes, thus permitting air to be distributed to the cylin-

ders as required by the cycle of operations.

In order to make the operations of the jigs clear, it may be assumed that the indexing movement has taken place and that the spindles are being fed up to the work by the feed cams until the holes are drilled to a depth of $\frac{9}{32}$ in. and the drills withdrawn. As there is always a jig in the loading position the operator is kept busy loading the jig during this period.

At the left-hand section, *A*, Fig. 3, on the line marked *E* and *F*, the intake port is open. Air is admitted to the cylinders at this point, clamping the work and closing the

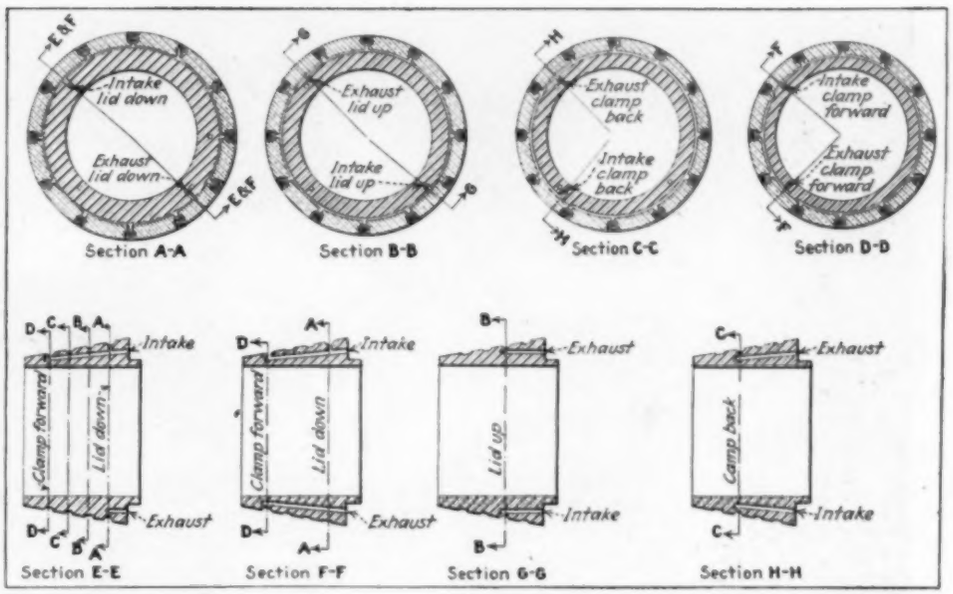


Fig. 3—Cross section through valve, showing air connections

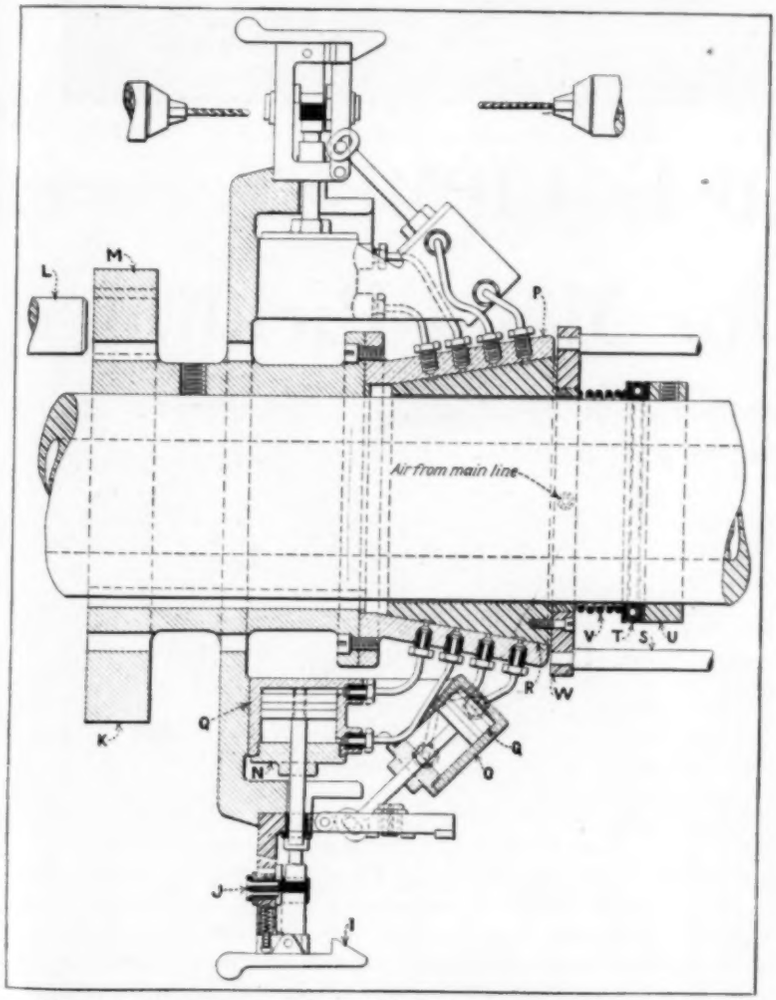


Fig. 4—Cross sections of valve and shaft, showing connection and parts

lid at the same time. Air is exhausted from the other side of the pistons through the ring *W*. The lid stays closed until it reaches the line marked *G* section *BB*, at which point air is admitted to the other side of the piston, and at the same time the exhaust port is opened, forcing the lid up, thus permitting the counterboring and milling operations to be performed. The spring latch has previously been forced back by coming in contact with a dog.

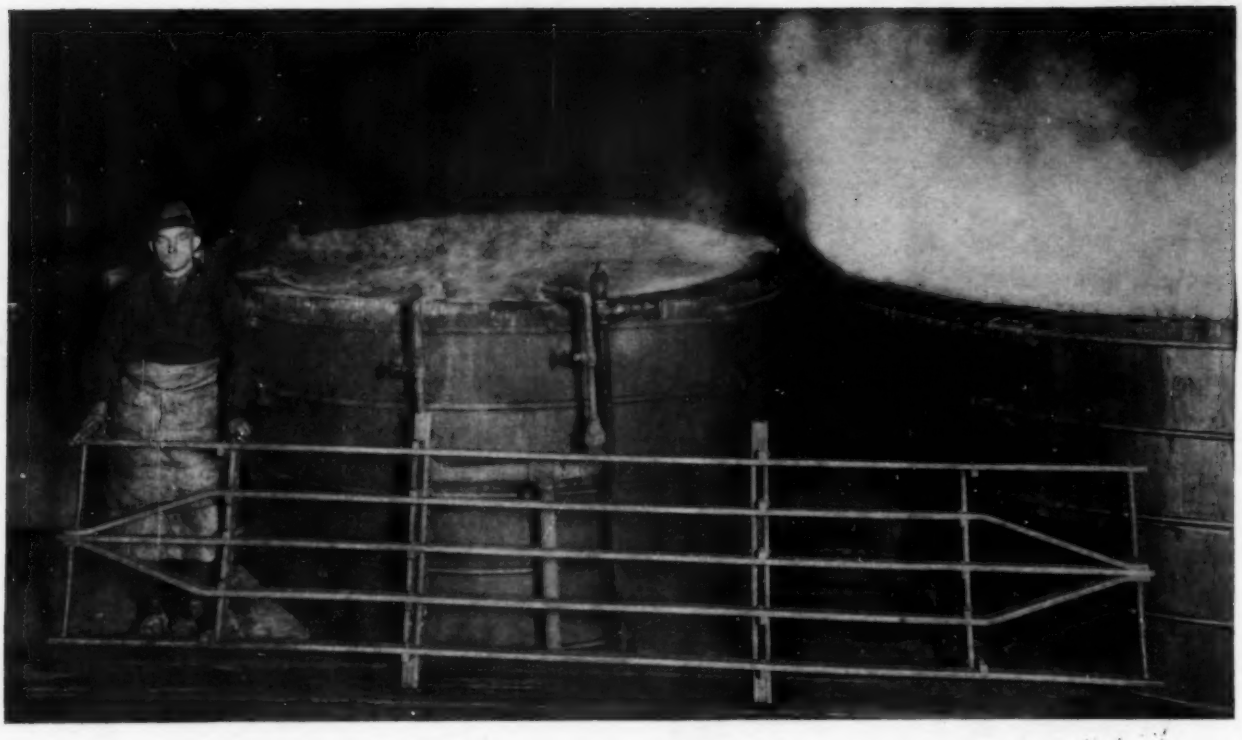
The clamp that holds the work in the jig is not released until after these operations have been completed, which is just before the jig moves to the unloading position, or when it reaches the line *H* section *CC*, as Fig. 3 shows.

The various vertical and horizontal cross sections of the operating valve in Fig. 3 show the intake and exhaust ports of the valve, and indicate how they are timed to control the operations of the jig lids and clamps in their proper sequence.

Aluminum—Not Aluminous

ALTHOUGH the term "aluminous," as applied to abrasives and oxides, has attained wide usage, it is not strictly correct from a chemist's or technician's standpoint, according to M. O. Lamar, of the Norton Company's research laboratory. This is largely because the chemist employs the ending "ous," as, for example, ferrous oxide and manganous oxide, to indicate the lower of two possible states of oxidation. Since aluminum has only one state of oxidation in which two atoms of aluminum join with three of oxygen to form Al_2O_3 the terms "aluminum oxide" or "alumina" are preferable to "aluminous."

Dictionaries define the term "aluminous" as being applicable to any material containing aluminum, but when "aluminous" is used with the word "oxide," it takes on a chemical significance and should be used according to the recognized rules of chemical nomenclature. While the term "aluminous abrasive" may be sanctioned even in dictionaries, the reference again is to the oxide of aluminum, Al_2O_3, hence the term "aluminum abrasive" is preferable. Care in the usage of these terms when applied in a technical or scientific sense will eliminate many misunderstandings.



LONGER-LIVED EQUIPMENT for Metal Pickling

Corrosion-resistant alloys are used in the construction of conveyors, racks and hoods of continuous and semi-continuous installations

By C. A. CRAWFORD

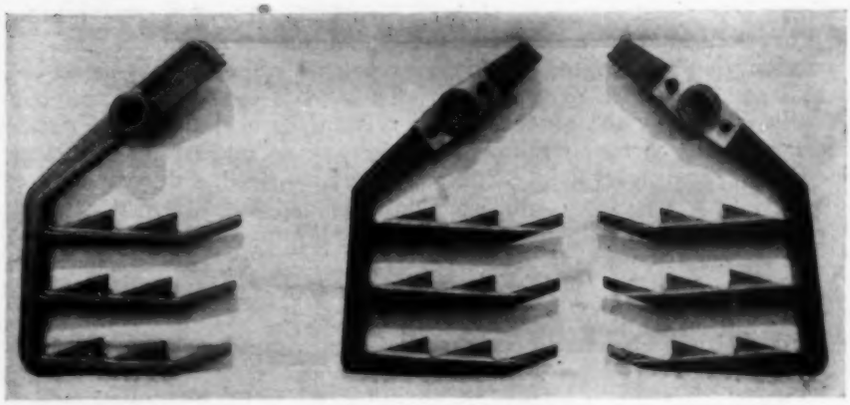
Development and Research Department, The International Nickel Company

PICKLING in metal manufacturing has increased in importance rapidly in recent years, keeping pace with newer ways of finishing, heightened standards of inspection, and the application of new materials. Not very long ago it was rather unusual to find pickling departments in plants carrying on secondary manufacturing operations, and practically all pickling was done at the primary source of semi-finished forms, such as sheet steel and wire.

The increased demand of the various industries for better surface finishes, for more careful inspection, and for more rapid manufacture have resulted in the installation of pickling operations further along the line, so that today material is pickled not only in the semi-finished form, but frequently in the final stages of manufacture. Outstanding examples are automobile parts, bodies, wheel rims, forgings, cabinet work of steel to be lacquered or japanned for furniture, refrigerators, hollow ware, and tinned or plated items.

The introduction of pickling in the final manufacturing operations has required the development of special forms of handling apparatus. In line with the general tendency to use conveyors in large manufacturing operations, pickling in continuous machines has been worked out in a number of applications. Continuous pickling machines to handle automobile wheel rims are an example of this sort. Similar machines are used on rim stock and on the rolled rims. In some cases the machine is lined up with a single conveyor which carries the steel in and out of pickling baths, continuing on through electro-galvanizing or cadmium plating operations and through tanks where lacquer or paint is applied, and finally through a dryer.

The operation of machines of this sort have presented many difficult maintenance problems. In the first place, the tanks must be kept very free from leaks. Fortunately, the items pickled in this way do not often require a deep tank, and a good job of lead lining is probably the best way to insure a leak-proof tank. For general pickling in large tanks, however, lead lining is seldom economical because of the high maintenance costs arising from the need of frequent patching as soon as the lead starts to sag and crack, because of the difficulty of supporting it in deep tanks. Furthermore, since there is no jarring nor mechanical abuse such as is likely to occur to lining of large tanks where the loads are lifted

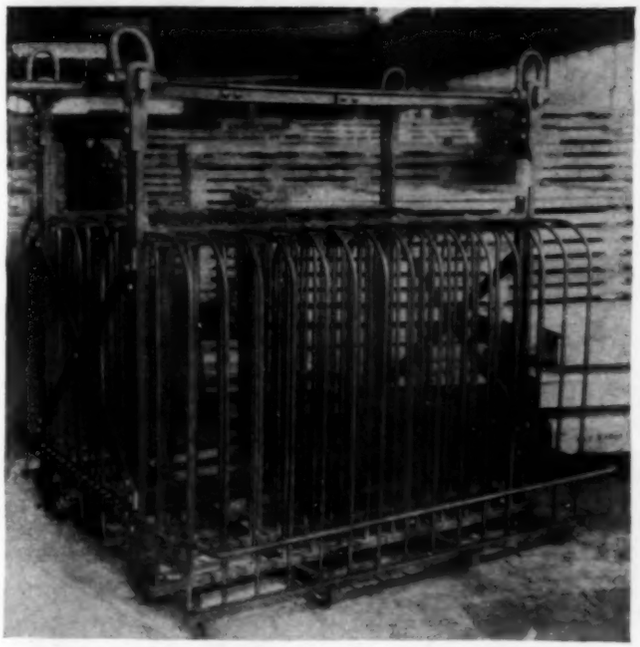


Continuous pickling of automobile rims is made possible by racks of special design such as these. At the left is a cast bronze hook, on the right, one of forged Monel metal

in and out by cranes, frequently tearing the lining, the average life of a lining in a continuous pickler is longer and usually pays for itself in a reasonable period.

The conveyor chains and the rails on which the chain rides are subject to severe corrosive attack, and parts of the chain and the carrier hooks must often pass through plating baths, alkaline baths and sometimes into tanks of lacquer and the drying ovens. For this reason, the use of resistant metals is required for these parts. Monel metal angles and flats have been used with great success and economy for the conveyor rails to carry the chain. Such rails can be easily constructed of standard shapes and will outlast steel or iron structures far in excess of the extra cost.

The conveyor drive chain is usually of cast construction, being of the link conveyor type, while the hooks



A pickling rack or crate designed for holding sheets. Increased rigidity is obtained by the U or hairpin construction. A cast rack of the same capacity would weigh about 50 per cent more

are either bronze castings or Monel metal forgings. Recently a new alloy known as Ni-Resist has been introduced for corrosion-resistant castings for this type of service. This is a cast iron to which has been added a fixed mixture of nickel, copper, and chromium, and is resistant to sulphuric acid, hydrochloric acid, and highly resistant to alkaline solutions. It also withstands high temperatures. It is admirably suited for service as chain and carrier parts on continuous picklers and costs less than acid-proof bronzes, being priced even below the prevailing cost of ordinary yellow brass.

To carry out these continuous pickling and finishing operations, it has been found necessary to locate them conveniently with relation to preceding and following operations, and as a result pickling tanks are often placed right in the middle of large factory buildings. It would be impractical to permit the fumes to be released into the room because of the destructive effect on men and machinery, and this has brought out a rapidly growing use of elaborate hoods to carry off the acid vapors.

Where the exhaust hoods have been made of a comparatively cheap construction, using galvanized sheets or lead-coated terne plate, the acid attack has been rapid, and various attempts have been made to protect such constructions by painting. This has not proved particularly satisfactory, and as a consequence the labor cost in maintenance has justified going to more expensive materials to give a longer enduring hood. Because of the relatively high price of acid-resistant metals, in the first constructions, thin-gage metals were used. Later on it was found that the service life of heavier gage material was so much longer that it greatly outweighed the increased cost. For example, in one installation where Monel metal sheet 0.025 in. thick was replaced by sheet 0.062 in. thick, the life was increased five to ten times, although the thickness (and metal cost) was only increased two and one-half times. Although the cost of the metal involved is considerable, the work of installation is even more costly, and it is cheaper in the end to

Another wrought Monel metal crate for pickling steel sheets. Simplicity and strength are apparent

make a better installation which will have longer life.

It has been found in hoods of this class that the worst corrosion comes from the outside of the hood rather than from the inside. The inside of the hood is continually washed by the condensed vapor from the acid baths, and any corrosion caused is at the normal rate for the anti-acid metal used. The outside of the hood, however, becomes coated with metallic salts and dust which tend to bake on. Under such encrusted areas an accelerated local corrosion occurs which will cause the metal to perforate in a very much shorter time than would be anticipated by its normal solution rate. As a result, it has been found good practice to provide for washing off the outside of ventilating hoods with a hose each week when the equipment is shut down. It has also been found that by painting the outside of the hoods with grease every few months the tendency to form encrusted deposits is materially reduced and the life of the hoods increased.

The use of continuous pickling machines, which developed largely from continuous plating machines, has worked back into the primary sources, so that now wire and sheets as well as strip are in some instances pickled in continuous pickling apparatus. These continuous pickling machines are new developments and have been made an essential part of the newer processes for rolling wide strip or continuous sheets.

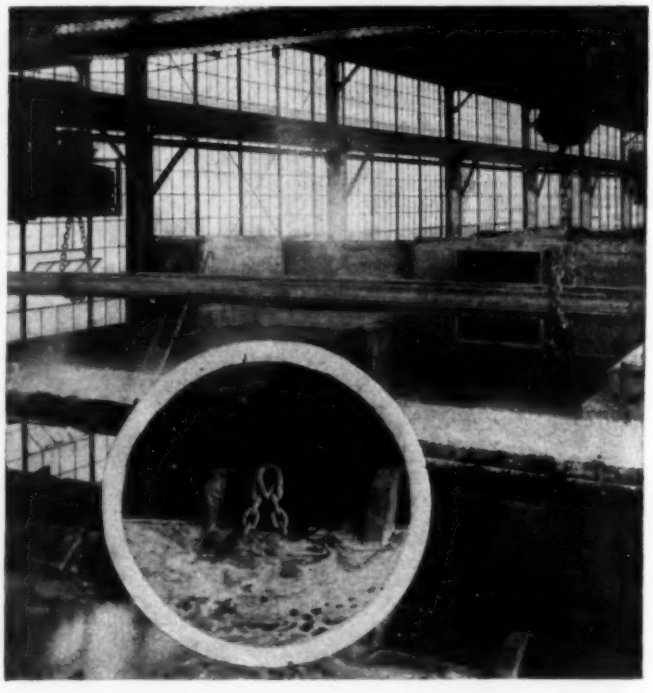
The introduction of these new ideas in sheet and tin mills has lead to a greater study of pickling operations, so that changes have been introduced in the mills which are still producing steel by discontinuous methods. A number of modifications of the old fashioned tin mill pickling rack have been developed with increased efficiency. Some of these racks are made of forged Monel metal bars and are about one-third lighter than the cast racks with removable pins, which they displace, besides carrying approximately 20 per cent more plate. They support the plate more completely, particularly at the upper corners, and permit rapid and complete cleaning with less returns for repickling. The introduction of sheets of Monel metal along the sides of these tin mill racks to baffle the surge of pickle solution as the pickling machine rises and sinks, probably raises the overall efficiency for the load by 2 or 3 per cent, a figure not to be scoffed at on a 100-ton day output for each machine.

The sheet mills are using pickling racks and carriers based on old designs, but have found it economical to utilize fabricated racks in place of the older cast racks. The cast rack was low in first cost, and the casting process was well adapted to permit the use of any detail in design that might be convenient for a particular purpose. Casting unquestionably allowed maximum flexibility in design. Cast racks did, however, have drawbacks which were inherent in the method. A reasonably large proportion of castings in pickling service break because of casting defects which are revealed by the acid attack. Although it has been the practice of users of such cast equipment to return scrap at reasonably high figures for recasting into new racks, yet the cost resulting from material spoiled by the breakage of racks, the delay of orders from damage in a spill, and the danger to workmen has amounted to a considerable item in the final accounting. This has gradually brought more and more into view the desirability of racks that cannot break suddenly without warning.

The introduction of fabricated racks made from forged and rolled sections for sheet mill use has required demonstration of the practicability of these constructions for general use. There have been objections to the use of riveted joints, although by now it is well proven that rivets of sufficiently large size, properly fitted and driven tight with large heads will remain tight for a long period of years. A great number of forged and riveted constructions in sheet mill racks of Monel metal have been in service for three, four, and five years and have successfully demonstrated the durability of such construction. A fabricated sheet mill rack will rarely break in service, and its life is long as it is necessary to dissolve away the Monel metal sections at their normally slow rate.

Another development that has grown into general acceptance is the use of forged and welded chains of acid-resistant metals which combine the strength and safety of steel chains with higher and more uniform corrosion resistance than is offered by casting alloys. Such chains are made in Monel metal in $\frac{1}{2}$-, $\frac{13}{16}$-, and 1-in. sizes. The $\frac{13}{16}$-in. size is the most popular, and this chain in Monel metal can be supplied to take a proof test of 10,000 lb. per chain.

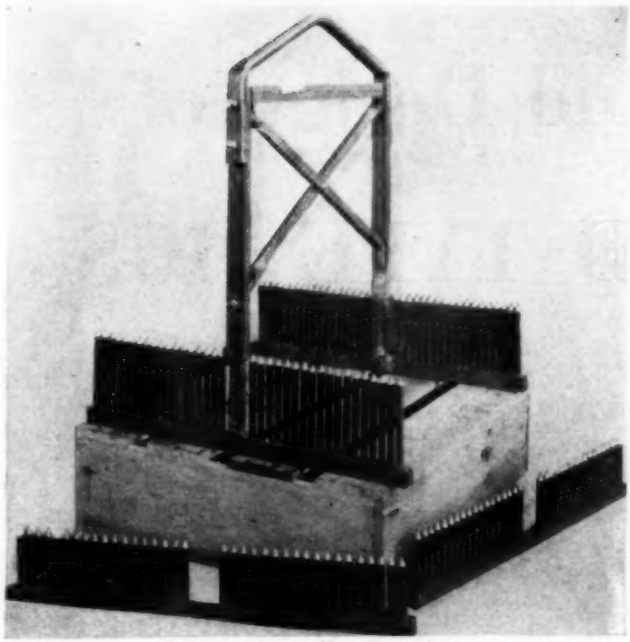
When it is desired to pickle cold-rolled steel for subsequent case hardening or carburizing, bronze chain or



The Monel metal chain shown is used in pickling steel bars in a bolt and nut plant. In the insert, the chain is shown after daily use for two years in boiling, dilute sulphuric acid

any chain containing copper cannot be used. Minute deposits of copper either by mechanical attrition or galvano-deposition will mask the carburizing and give undesirable soft spots. To meet this condition, one manufacturer tried a set of forged and welded chains of pure nickel. This chain was found to have no detrimental effect upon the carburizing of the steel. The strength of the nickel chain is only slightly less than the Monel metal chain, and its corrosion resistance is almost as great.

The growing use of stainless or rustless alloy steels



This special carrier was developed for pickling short lengths of steel strip in an automobile wheel plant. The combs on the floor carry a second tier of strip

and irons of various kinds has presented new problems in pickling, but has also offered new tools. Nitric acid is being used more extensively in pickling for high-nickel alloys, including alloy steels, stainless steels and non-ferrous nickel alloys such as Ambrac, Adnic and other high-nickel brasses and bronzes, Monel metal and pure nickel. The nitric acid is used in mixtures with sulphuric acid and common salt.

Where no salt nor hydrochloric acid are used, the high-chromium stainless alloys, which are now appearing in the form of castings, will make excellent cast tanks for holding the pickle solution. They are, of course, heavy, expensive, and subject to the general limitations of castings, but in general offer an acceptable alternative to the dangers of broken stoneware. If muriatic acid or chlorides are needed in the pickling solution, chemical stoneware crocks still seem the best containers, these and acid-proof linings, properly built.

For use in its own process the International Nickel Company has developed a pickling solution that can be worked hot without undue fuming and which will pickle Monel metal, pure nickel, and the high-nickel white metals (Ambrac) with good results. This solution is 1 part by volume nitric acid or sodium nitrate, 1 part sodium chloride (common salt) and 8 parts sulphuric acid (commercial 60° Bé.) to 90 parts of water. The solution works best at 165 to 185 deg. F. For carrier construction for handling material in and out of this nitric-hydrochloric-sulphuric mixture, the best thing as yet found is an alloy of nickel containing approximately 4 per cent manganese and known in the trade as "D" Nickel. This can be obtained in rolled sections for fabrication into racks or carriers, and while it is attacked by the pickle solution described, it will outlast by a wide margin anything else so far tried.

In iron castings, because of the sand from the molds, it is usual to pickle in hydrofluoric acid which dissolves the silica sand. Monel metal baskets of many types and hooks or carriers work well in hydrofluoric acid also.

How Much Efficiency?

By W. F. Schaphorst
Consulting Mechanical Engineer

HIGH efficiency is a good thing provided it is economical. But there is such a thing as carrying efficiency too far. An efficiency of 100 per cent is unattainable. Yet nearly every manufacturer of machinery involving efficiency, whether mechanical or electrical, is striving for that ideal. One manufacturer went so far, not long ago, as to advertise the attainment of 100 per cent efficiency. It was perhaps within his legal right to make such a claim, but it seems to me that he went too far when he stated that similar competing products showed efficiencies of only 75 to 80 per cent. I wrote to the manufacturer asking for information regarding the efficiency he claimed but it was never made clear to me. I did receive a courteous reply to my letter, but the difference in efficiency was not explained, nor was I told how such a high efficiency was attained.

Recently I have seen improbable efficiency claims made by belting manufacturers. The maximum per cent of efficiency obtainable for leather belts is about 98.2 per cent. Steel belting on ball bearings can probably do better than 98 per cent, but steel belting has not been found to be very practical. Any belt that is elastic will creep during the transmission process, causing loss of power.

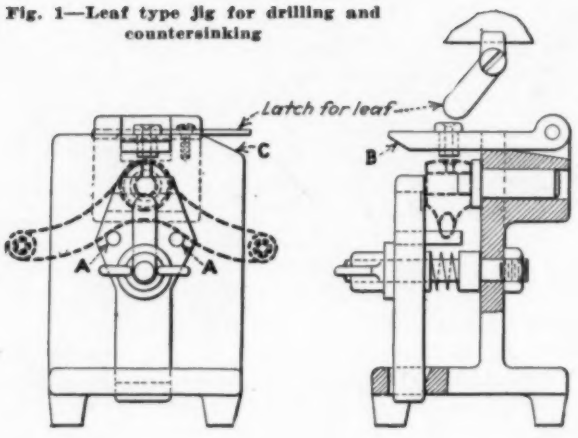
Many claims for gear transmission efficiency are unnecessarily high. An accurately made gear can have a transmission efficiency as high as 99.5 per cent, but of course such gears are exceptional. The efficiency of a first-class silent chain drive can be 98 per cent or possibly 99 per cent. The efficiency depends largely upon prevailing conditions. One manufacturer said to me: "If we were to be conservative we would say that the efficiency of our chain is from 95 to 98 per cent, depending on varying conditions." That surely is conservative.

Efficiency always has been, and always will be, equal to output divided by input. Thus, if an engine is delivering 100 hp. to its flywheel, and if that flywheel is belted to a driven pulley, and if it is possible to get only 98 hp. out of the driven pulley, the efficiency is 98 divided by 100, which equals 98 per cent. Efficiency has positively nothing to do with first costs, space occupied, continuity of service, maintenance expense, operating expense, or anything of the sort. Extravagant claims do not pay.

LONG shear blades have been hardened successfully by one company in a furnace which maintains a hardening temperature varying from 1,350 to 1,550 deg. F., depending on the kind of edge used. The edges are either alloy or straight-carbon tool steel welded to mild-steel backs. The stock is placed in the furnace on edge and allowed to come up to heat slowly and to get a uniform final temperature, thus saving unusual strains in the material. The temperature is checked several times very carefully just before unloading the furnace for the quench. From the time of loading until the average weight of stock is removed, about one and a half hours elapses. Temperatures are checked so that from cold to the desired quenching point the heat curve goes up steadily and varys slightly from a straight line. This seems to give a better structure in the material than rapid heating plus slow soaking.

The Planning and Design of STAND TYPE JIGS

Fig. 1—Leaf type jig for drilling and countersinking



By J. A. POTTER
Chief Draftsman, Singer Manufacturing Company

Standards of quality and tolerance, as well as available machines, dictate the type of fixture and the number of operations

MANY ITEMS enter into the proper design of jigs and fixtures that are not apparent to the casual observer. To him a finished jig or fixture may seem to be nothing more than rough castings or built up pieces of steel with a few seats, and straps to hold a part in place. The study of the operation writer to provide a proper sequence for machining, the care with which the tool designer laid out those straps to hold the work without springing it, and the accuracy with which the tool maker set the seats and bored the holes, do not show on the surface, but the real value can be easily determined when the tool is put into use.

It will be found that tool design is not a haphazard, hit-or-miss proposition. Each manufacturing concern must decide upon the quality of work it wishes to produce, and it must adopt certain standards of design and tolerance that will produce that quality. Medium sized pieces are adapted to a variety of jig designs, the standards adopted will determine the style of fixture and the number of operations to be performed in each jig or fixture.

For instance, if a piece requires fourteen operations of drilling, reaming, countersinking, and counterboring to be done in one jig, it can be handled in several ways. The operations can be performed on two eight-spindle gang drills or on three six-spindle machines, or even on four, four-spindle machines by passing the jig from machine to machine and returning it to the original station on a conveyor. This, of course, requires several duplicate jigs, and is one method for large production. The same jig can be used on any one of the machines by carrying out eight, six, or four operations, according to the number of spindles, and by finishing up with a change of tools in quick acting chucks for the remaining

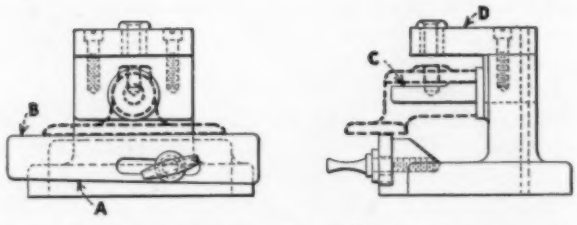


Fig. 2—Stud and angular slide method of holding a part

operations. Either of these methods may be said to have a good point in that all operations are performed in a jig at one setting, all holes being necessarily in proper relation with each other, yet one method ties up machine tools, and the other wastes man hours.

If for the same part with fourteen operations, two or three jigs are made for the eight- or six-spindle machine, a more flexible arrangement results. It is possible to group the larger holes in one jig, and the smaller in another, gaining time by the use of a faster speed for the small holes.

The size of the parts to be drilled will, of course, have a decided influence on the type of jig to be adopted. Large parts will usually be handled with the templet and stand type of jig, in preference to the box form. The usual run of templet design, however, is not a very interesting proposition, though considerable ingenuity is required to position and hold some templets in place. Exceedingly small parts with the corresponding small holes are often not drilled under the drill press at all, but are fastened to a stem with a balance wheel and loaded into a specially devised steady rest on a speed, or watch lathe. The tail end is then revolved in a direction opposite that of the chuck which holds the drill.

This method will keep a small hole straight, and the best results will be obtained by its adoption.

An oil hole in a part is an important feature, although the drilling of such holes seems of little importance as applied to jigs. True, an oil hole may be over, or under, size, and may even run out, without spoiling work; yet the relative position on the part must be considered when the hole is to meet an oil tube or channel on an adjacent part.

Location of part, speed in operation, lightness, and cheapness are the features of an oil hole jig.

The sketch at Fig. 1 shows a lever that has been drilled, reamed, tapped, and counterbored in a previous jig. This leaves the oil hole to be drilled and countersunk, which can be done in the jig shown by drilling with the leaf down and afterward countersinking with the leaf thrown back. Pins *A*, in the clamp, engage the arms of part to keep it in position while being clamped. The latch for holding the leaf is simple, yet positive in action. The angle at *B* is provided so that the operator will not bruise his thumb when throwing back the leaf. The angle at *C* is for clearance when pushing back the latch handle. Clearance in the jig at the heel of the clamp is to allow for rocking if there is any variation in the width of the parts. A more positive location could be made by using a plug in the main hub and another for one of the tapped holes in an arm, but it would mean greater weight in the jig and additional boring for the toolmaker, with no increase in value as an oil hole jig.

The bracket in Fig. 2 was drilled, reamed, and faced in a two-jaw chuck leaving the oil hole to be drilled in a jig. The bracket is located and held in place by the plate *B*, which is flat on top and tapered at *A*. The movement of this plate to the left will bind the part, and the thumb screw in the elongated slot will hold the plate. Locating stud *C* has been cut away to allow for burrs on the part after drilling. As there is to be no countersinking operation, it is not necessary to provide a leaf for the bushing, which can be driven into a simple plate *D* dowelled to the body of the jig. The jig has no legs,

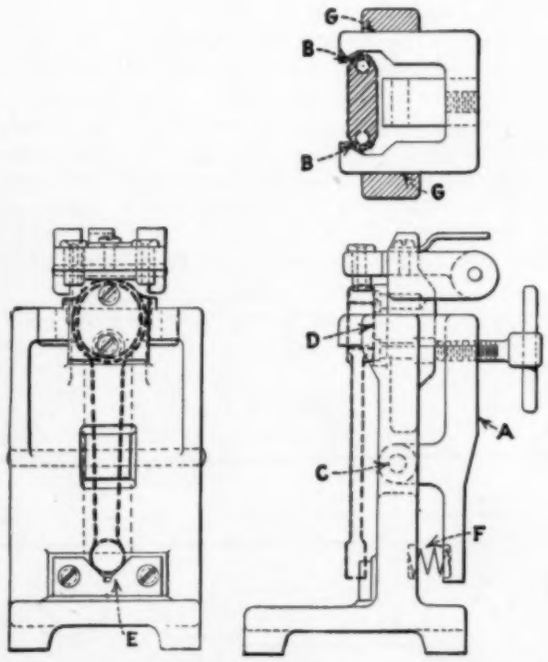


Fig. 3—Rocking clamp type of jig with hinged bushing leaf

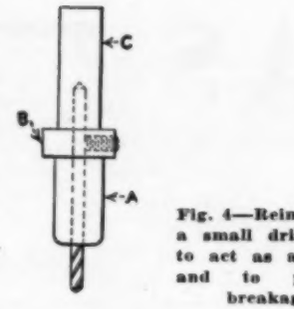
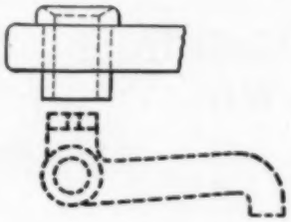


Fig. 4—Reinforcing a small drill both to act as a guide and to prevent breakage



as it is a type which clamps in place on the drill press table. Another drill jig of the stand type, although not for an oil hole, is illustrated at Fig. 3. It shows a rather unusual method of clamping. The small connecting rod has had only one operation performed, that of disk grinding the large hub, prior to drilling. The small end of the rod rests in the V-block *E*, and the ground surface rests against the plate *D*. Clamp *A* swings on the hinge pin *C*, and the two prongs of the clamp at *B* pull the rod against the seat when the bar screw is tightened. Spring *F* opens the gripping prongs when the screw is loosened. Prongs *B* are supported at *G* so that they will not spring apart when tightened. The leaf that carries the drill bushings can be thrown back, enabling the operator to drill both tap and body size holes. The operation sequence is also unusual for a connecting rod, but when it is explained that the binding screw lugs on the forging are very thin and have a close clearance with other parts on the apparatus the reason for selecting them as working points, rather than the large hole on the cap end, is apparent.

One difficulty in small-hole drilling is the snapping of drills when "picking up" the bushings in the jig. Jigs for small holes are, therefore, made as light as possible in order to overcome this tendency. Some designers use built-up steel construction to keep the weight down, but this is not necessary. With a single-hole jig, the best method is to strap the jig to the drill press table directly under the spindle. With two or more holes, it becomes necessary to move the jig under the spindles. Many methods are resorted to, such as sliding the jig against parallels strapped to the table, or providing an auxiliary table which rides on rollers so that the jig will slide freely. These, however, are makeshifts as compared to the simple drill holder illustrated at Fig. 4. The bushing is made much larger than the drill, and the stem of the holder fits what would otherwise be the drill bushing. This not only guides the drill and provides plenty of clearance for chips, but the rounded end of the stem and the cupped recess in bushing, act as a pilot in picking up the bushing when sliding the jig. The hub at *B* is made large to allow plenty of screw thread, and the shank of the drill can be flatted on drills over No. 50 size so that the screw will hold better. The shank at *C* can be made to fit a drill chuck, or it can be tapered to fit a drill press spindle. It will also be found that these holders can be used to advantage as drill extensions.

Precision control is almost vital in the welding of thin steel sheets. If too little heat is applied, the sheets will not be fused together. If too much is applied, the sheets will be burned through.

IDEAS FROM PRACTICAL MEN

The department, "IDEAS FROM PRACTICAL MEN," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit.

Making Flat Coils from Copper Wire

By CHARLES H. WILLEY
Asst. Plant Supt., Hoyt Electrical Works

IN MAKING the three-turn coils of enameled copper wire used in dash ammeters, the tools illustrated have been successfully used for a production of 500 per hour. The coils, one of which is shown in Fig. 1, are completed in two operations, the first one being shown in Fig. 2. The first operation consists in making the first half-turn of the coil, cutting off the wire and bending the end at a right angle. In Fig. 3, the result of this operation can be seen. The wire is fed from a spool through the series of grooved rolls at *A*, Fig. 2. The rolls are staggered so as to straighten the wire, which is pulled through them by the lever-operated gripper *B*. The gripper also acts as a feeder for the free end of the wire, pushing it through the hole in the cutting-off die *C* and up to the stop at the end of the guide plate *D*. The guide plate is mounted on a turret having an oval-shaped stud around which the wire is formed in a half-revolution by means of the lever *E*. In cutting off the wire by the foot-operated press to which the fixture is attached, the end is bent at a right angle.

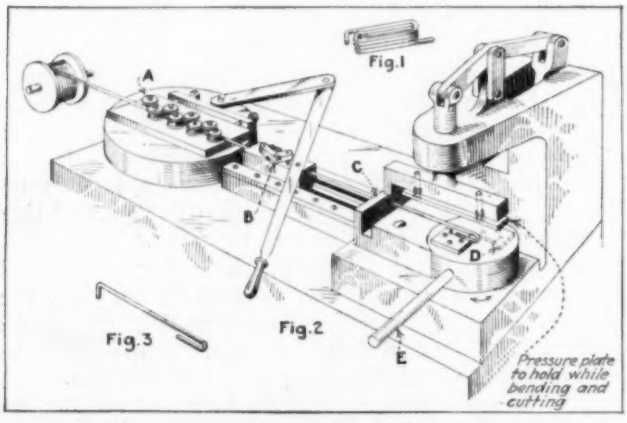


Fig. 1—One of the completed coils. Fig. 2—Fixture for the first operation. Fig. 3—The coil after the first operation

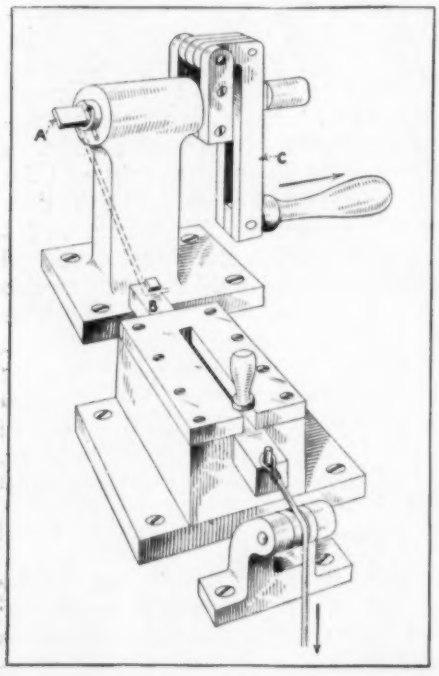


Fig. 4 — Winding fixture for completing the coil

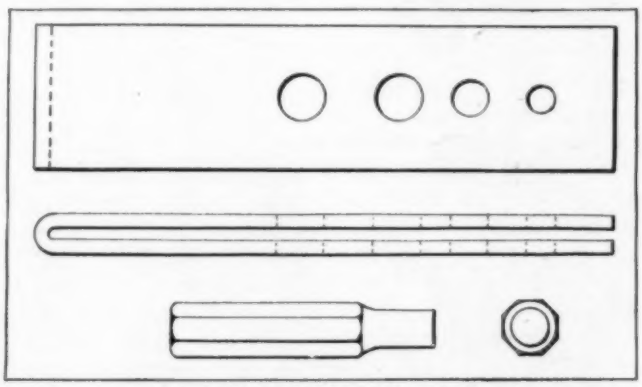
In the second operation, the piece is put into the fixture shown in Fig. 4. The partly-formed coil is hooked over the mandrel *A*, and the right-angle bend at the opposite end is hooked over a projection on the slide *B*, as indicated by heavy dotted lines. One end of a cable running over a roller is attached to the slide, while from the other end a weight is suspended. Thus, the wire is kept under tension.

By turning the crank *C*, the winding of the coil is completed. The crank is pivoted to the driver and spans a flatted spot on the rear of the mandrel, so that by swinging it in the direction of the arrow, the mandrel is withdrawn from the coil.

A Hand Punch for Sheet Metal

By P. H. WHITE

The illustration shows a hand punch that can be made very easily, and that will be found very useful on light repair work. The die is made by bending a piece of flat bar stock back upon itself, leaving a narrow space between the two inner surfaces. A number of holes, corresponding to the sizes that are to be punched, are drilled through the doubled bar. The bar should be carburized and hardened, and the holes should be lapped to size. If one cares to go to more expense and refinement, the holes may be fitted with hardened steel dies. Punches are turned, hardened, and finally ground to fit.



A convenient hand punch and die

In use, the sheet to be punched is inserted between the two leaves of the bar; then the punch is placed in the proper hole and is struck a sharp blow with a hammer. The holes in the lower part of the bar serve as dies, while those in the upper part serve as guides for locating the punches and holding them in alignment with the dies.

Preventing the Breakage of Small Taps
Discussion

By Andrew J. Schwartz

In regard to the article by Wm. S. Rowell on page 1020, Vol. 70, of the *American Machinist,* it is my opinion that the author advocates the removal of metal from the wrong piece.

There is no need for threads of full depth in tapped holes because, under strain, the screws will be ruptured without the threads in the holes being stripped. If the holes are of a size that will have from 62 to 75 per cent of full-depth threads, there will be little danger of breaking the taps. Consequently there will be no necessity for reducing the sizes of the taps by grinding off the tops of the lands, nor of using two taps of different sizes, as recommended by Mr. Rowell.

An Adjustable Multi-Spindle Drill Head

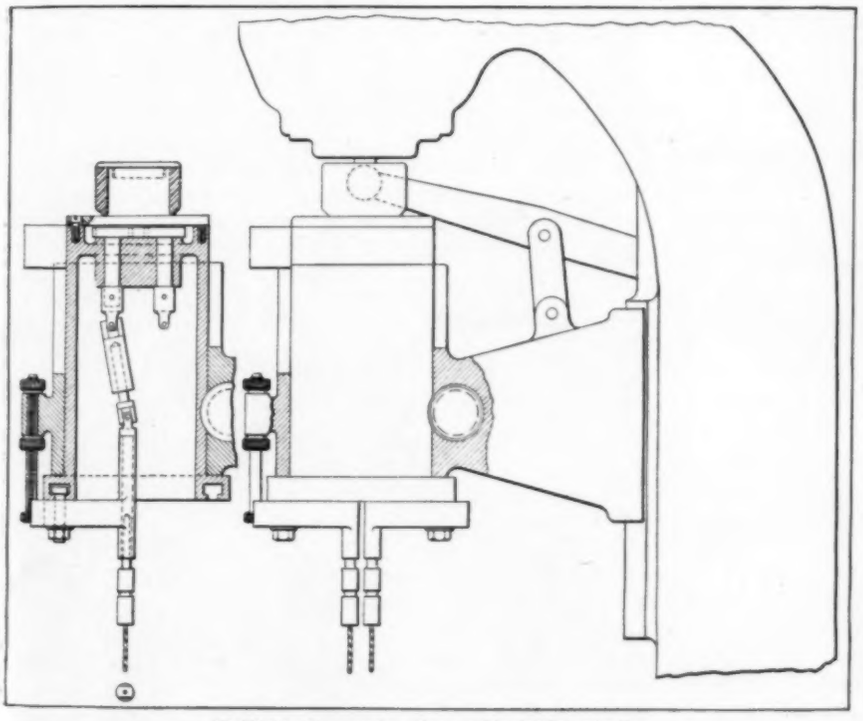
By R. E. McCoy

The drill head shown in the illustration was adapted to a sensitive drill press of standard design. Its four spindles can be adjusted to center distances of from $\frac{7}{16}$ to $1\frac{1}{2}$ in. The only changes in the machine itself were a new arm for supporting the quill and the spindle, and a new quill for holding the four spindles.

The auxiliary spindles are inclosed in the quill and are driven by gears through a pinion attached to the main spindle. The gears are all packed in grease and are inclosed in a pocket in the upper part of the quill. The four auxiliary spindles are connected to the adjustable spindles by universal joints, in the manner usual to drill presses in which the spindles are adjustable for center distances.

A circular T-slot in the bottom of the quill provides means for attaching the bearings for the adjustable spindles and for adjusting them to various center distances. A lug on the outer end of the arm carries an adjustable stop-screw, on the upper end of which a lug cast on the quill abuts.

This drill head has been in use for some time and has proved to be very satisfactory on small work.

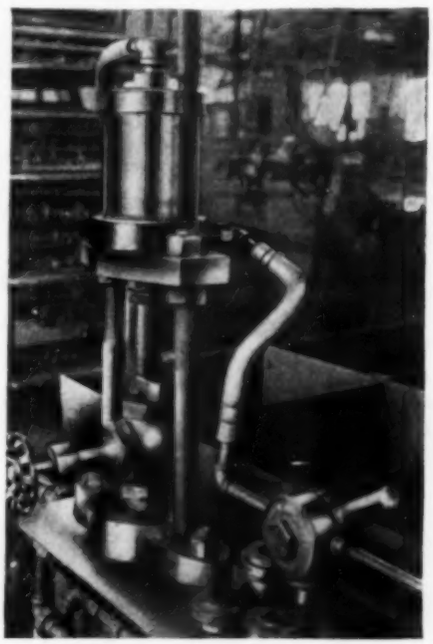


Drill head carrying four adjustable spindles

Device Tests Globe Valves for Tightness

By Frank J. Oliver, Jr.

After globe valves have been repaired in the shops of the Chicago & North Western Railway Company they are tested for air tightness by means of the device shown in the illustration. In principle, it consists of a hold-down mechanism and a means for introducing air into the valve at a pressure of 90 lb. per sq.in. During the test the open end of the valve is filled with water, and if the valve is not absolutely tight, the condition will be revealed by air bubbling through the water. This water is poured into the open end of the valve by hand from an ordinary oil can with spout. In the illustration the cylinder shown on top has a piston and ram which is used to supply the hold-down pressure.



Device for testing globe valves for air tightness

The piston has a diameter of 4 in., and is connected to the regular air line through the reversing valve shown to the right, so that a total pressure of about 1,100 lb. is developed. The ram carries a crossbar at its end, thus bridging the opening in the valve and allowing the water and any air bubbles present to be seen. This ram has a stroke of 4 in. to accommodate

various sizes of globe valves ranging from ½- to 2-in. nominal pipe size. For the same reason, variously sized adaptors are used between the base of the device and the bottom part of the valve, in the position shown. One end of the adaptor slips into a hole in the brass base and is sealed by a leather gasket, and the other end also carries a leather gasket of about the same outside diameter, but of much smaller inside diameter, depending upon the valve size.

In operation the globe valve being tested is placed in position on the leather gasket and is clamped by the hold-down valve. Air is then admitted to the lower half of the valve by opening the cock at the left in the illustration. Obviously it is but the work of a moment to test each valve in this manner.

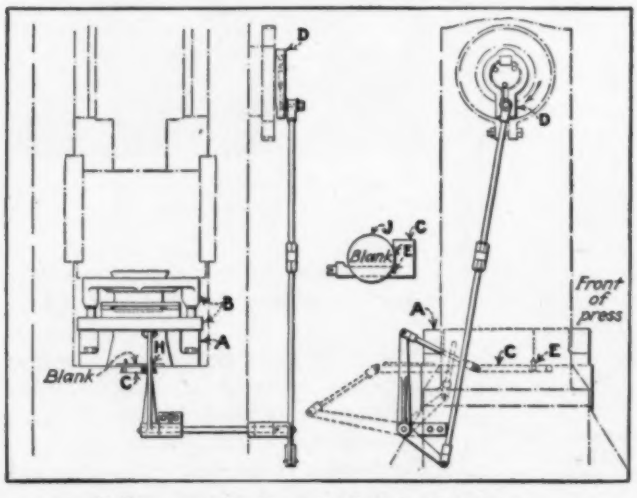
Automatic Delivery Mechanism for a Press

By B. J. Stern

In a job shop having a number of presses, it was found necessary to make a quantity of circular blanks about 12 in. in diameter and ½ in. thick. The only press in the shop that was capable of doing the job was a big straight-sided machine, used for forming and shaping large pressed-metal parts. This press was not provided with a hole in its bolster and bed through which the blanks could drop, so that it was necessary to apply the attachment shown in the illustration.

The old bolster was removed and the one shown at *A* was substituted. The new bolster was cut out in the back to allow the blanks to drop through after they were stamped by the die *B*. The blanks dropped upon the slide *C* which was fitted in a dovetail already in the press bed. The slide *C* was connected by articulated links and levers to the crankpin *D* attached to the end of the crankshaft of the press. The throw of the crankpin could be varied, thus changing the travel of the slide *C* to suit conditions.

After the blank had been stamped, it would drop through the bolster and onto the slide *C*. As the crankshaft revolved to bring the ram up, the slide would be moved as shown by the dotted lines, the various links and levers assuming the positions shown. The pins *E* on the slide *C* would catch on the blanks and carry them out so that they would rest partly on the slide and partly on the bed of the press, as shown at *H*. The slide *C* being cut out as shown at *J*, would provide no support for the blank at the end of the stroke. The overhanging weight of the blank being unsupported either by the press or the slide, was sufficient to overbalance it and to cause it to drop off and onto a chute (not shown) into a tote box. The slide *C* would then be returned to its original position, ready to catch another blank as the ram came down.

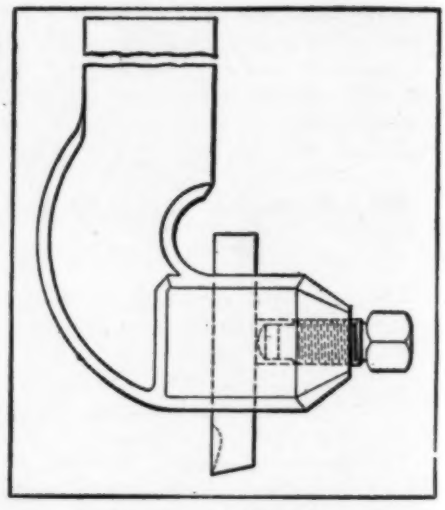


Delivery mechanism attached to the press

A Gooseneck Toolholder for the Shaper

By H. L. Wheeler

The gooseneck tool has long been known to have advantages over straight tools in shaper and planer work, but since toolholders and toolbits have come into general use, the gooseneck tool seems to have lost considerable of its old-time prestige, probably because but few toolholders of suitable design are available. The present straight toolholders used in most shops for planer and shaper work have the same drawbacks as have the old-style straight, forged tools, and unless the toolbits are carefully ground for rake and clearance, trouble is likely to be experienced with the heavy cuts that are demanded today. In a shop of my acquaintance, straight toolholders have been discarded for most of the shaper work, and toolholders such as the one shown in the sketch are being used. They are made of nickel-steel, heat-treated, and will take the regular standard toolbits. Much heavier cuts can be taken with them than with any straight toolholders I have seen.



A gooseneck toolholder

An Accurate Scribe Block for Toolmakers
Discussion

By Rudolph Keil

I should like to offer a slight addition to the device described by Charles Doescher in an article under the title given above, on page 332, Vol. 71, of this journal.

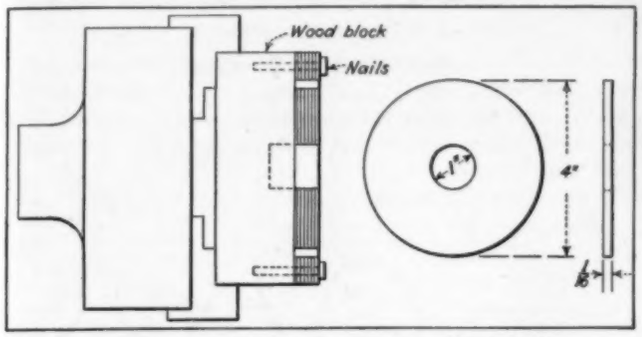
The range of the device can be increased by drilling and tapping two more holes, one in each of the sliding blocks *B* and *C*. The holes should be perpendicular to the short leg of the angular block, which can then be used as an additional base. The two surfaces in which the holes are to be drilled must, of course, be ground parallel with the short leg. In short, this change will permit the use of both legs of the block as bases, thereby increasing its range.

Making Washers in Small Lots

By Charles Kugler
General Electric Company, Philadelphia

Making comparatively thin washers is generally a troublesome job, especially if they are made one at a time, which is the usual practice.

Six washers like the one shown in the sketch were wanted for a special job and were made in the following manner: Six pieces 5 in. long were cut from 5-in. stamping metal, $\frac{1}{16}$ in. thick. The blanks were clamped together in a stack, and four small holes for nails were



Method of holding blanks for machining

drilled about $2\frac{1}{4}$ in. from the center. The stack of blanks was then fastened by nails to a block of wood held in the lathe chuck. The center hole was bored first and then the stack of blanks was bored out to 4 in. in diameter, using a parting tool. When washers are made by this method, the job presents no difficulties.

Planing Locomotive Crossheads

By J. H. Hahn

A crosshead set up on a crank planer for planing the shoes after they have been lined with bronze is shown in Fig. 1. The set-up is a little out of the ordinary, in that a through mandrel is used instead of the crosshead being supported on the overhanging end, as is usual.

Everything possible has been done to make the work more convenient for the operator. The bottom of the

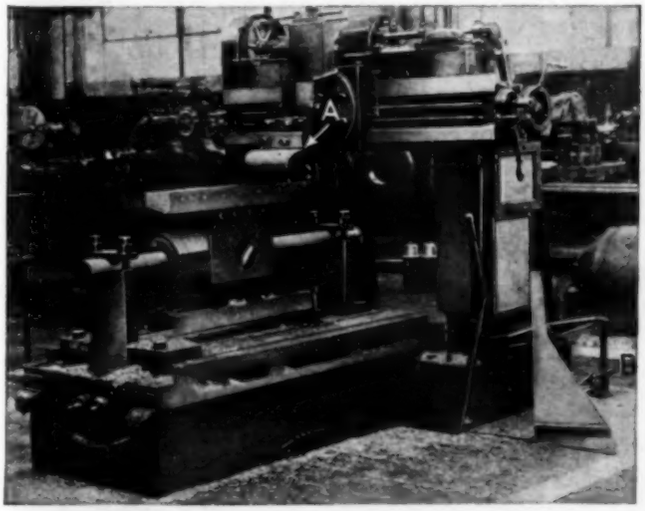


Fig. 1—Crosshead set up for planing the shoes. Note the through mandrel supported at both ends in V-blocks

Fig. 2—Rack for crosshead mandrels

planer bed is set below the floor level so that the work is on a lower plane, otherwise it would be necessary for the operator to stand on a box, or on a platform, while adjusting the tool. The shield at *A* prevents the chips from flying. At *B* is a special gage for squaring up the work, and on the planer housing are framed charts giving the dimensions for planing the crossheads for 25 or 30 different classes of engines.

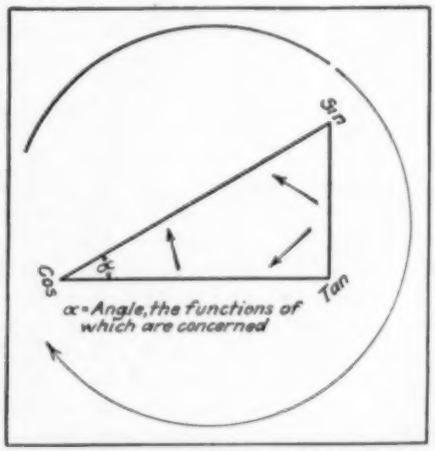
A rack for holding the various-sized mandrels is shown in Fig. 2. It is located near the planer and keeps the mandrels off of the floor. The tapered parts of the mandrels where they fit the crosshead bores can be plainly seen. The planer is used solely for planing crossheads and is always set up for this class of work.

An Aid in Remembering Trigonometric Functions

By E. Simonsen

Recalling a former article on the subject of trigonometric functions, in the *American Machinist*, I have been led to submit the following as an aid in remembering the principal functions of a right-angle triangle.

In the sketch are indicated the definitions of the three principal functions of the angle one side of which is the base of the triangle. The name of each function is just outside the vertex of the angle the ratio of the adjacent sides of which constitutes the function indicated. Just



How to remember trigonometric functions

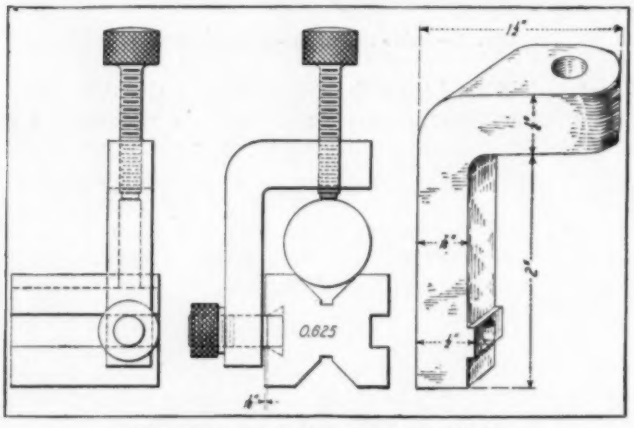
inside each vertex, an arrow leads from the numerator to the denominator of the ratio. Beginning at the vertex of the angle the functions of which are defined, the names of the three principal functions are in alphabetical order, clockwise.

In referring to the figure shown, it should always be kept in mind that the functions are not lines, but ratios of the lengths of lines.

V-Block and Clamp for Right-Angle Layouts

By Theodore Kruger

Having to lay out many small punches and dies on round stock, I devised a clamp and put a dovetail slot in one edge of the V-block, as shown in the illustration. This device enables me to make right-angles without recourse to parallels, which had to be used in connection with the clamp that came with the V-block. The



The clamp and the altered V-block

distance from the center of the block to the edge is 0.625 in., and I have etched these figures on the end of the block for convenience.

The clamp is made from ½-in., cold-rolled steel, and has a screw, the head of which is made to fit the dovetailed slot in the block. This clamp, and the altered V-block, have been a great help in my work.

Preventing the Breakage of Small Taps *Discussion*

By J. T. Towlson

London, England

After reading the article by Wm. S. Rowell, under the title given above, on page 1020, Vol. 70, of the *American Machinist*, I am prompted to give my opinion as to the proper method of using taps without breaking them.

First, a set of three taps should be used. The first one should be run in until it is tight, according to the operator's judgment. Then it should be withdrawn, and the second one should be run in until it also is tight. Then the first tap should be used again, followed by the second. Finally, the third tap should be used to finish the job. This procedure is as easy and natural as can be, and any man should be able to follow it in the dark, or with his eyes shut, if need be. The alteration of new taps by grinding should be strictly barred.

Practical Shop Problems

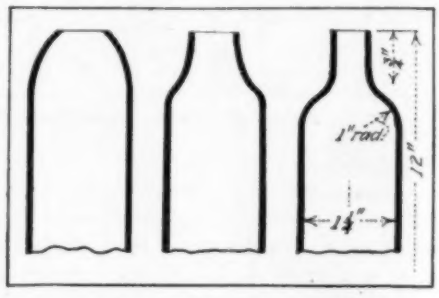
Questions of a Practical Nature will be answered in this column

"Necking in" Drawn Shells

Q. We have a large number of shells 12 in. long, 1¼ in. outside diameter, drawn from 16-in. sheet steel. They must be necked in as shown in the sketch. Can you give us information as to how this should be done in order to make a production job out of it?

A. We would suggest using a long stroke dial feed press sufficiently heavy to do one, two, or three operations depending upon the amount of work possible between annealing operations, and the quantity of shells to be done.

A series of plain round dies should be used in the dial plate, which should reindex every two seconds. Cupping dies of three different shapes should be used in the ram, if, as before stated, the metal will stand up, without wrinkling and does not require annealing between the operations.



The first operation should leave the wall of the shell convex, the second one, concave, and the third should be a finishing and sizing operation. The amount by which the shell can be closed in a single operation may be easily determined by the fact that the wall will wrinkle if the reduction is too great in any one operation, or the metal is too hard.

Marking Hardened, Polished, Surfaces

Q. Can you inform us what method is used for marking polished surfaces such as on razor blades and crankpins?

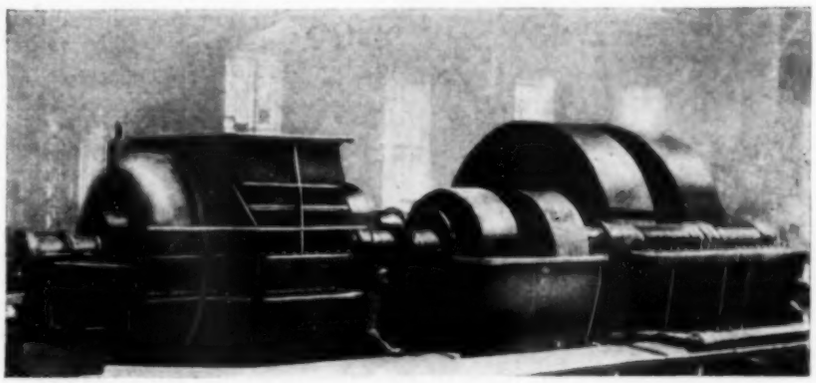
A. Such marking is usually done by a rubber stamp, with a solution of nitric acid and nitrate of silver. Sometimes a small quantity of copper sulphate is added in order to color the etching. However, there is no standard formula that we are aware of. The proportions of the chemicals and water can be varied to suit individual requirements. To start, we would suggest using ten parts of nitric acid and one part of silver nitrate to twenty parts of water. Mix a small quantity only, and if the results are not satisfactory, increase or decrease the amount of water.

The acid is, of course, highly corrosive and must be handled carefully. The best method, we are told, to apply the etching fluid is to take a piece of blotter, or possibly asbestos paper, a little larger than the rubber stamp to be used, lay it on a piece of glass and saturate it with the etching fluid, using it as a pad. After finishing the marking, the pad should be destroyed and both the glass and the rubber stamp should be well washed.

Engineering Materials Analyses

Curtis-Type 3,500-hp. Steam Turbine

Analysis of a Curtis-type turbine consisting of one high- and one low-pressure unit, with double-reduction gear, built by the Newport News Shipbuilding & Dry Dock Company, shows 559 different parts and a total of 5,524 pieces. This does not include auxiliary parts, auxiliary steam piping, throttle, relief valves, lubricating oil piping, or anything beyond the bare turbine and reduction-gear parts. Most of the materials are given rigid physical tests, in addition to which some of them must also undergo chemical tests before acceptance. Special alloy steels are employed for the rims of the reduction gears and for the pinions that mesh with them



The reduction gear train of compound marine turbines must be designed so that its various parts will not only carry the heavy tooth load necessary, but will also withstand the shock of the racing and checking of the propellor as it alternately clears and submerges in heavy seas. Vibration and "howl" must also be reduced to a minimum, as they are objectionable to passengers during the night hours

Aluminum

ALUMINUM CASTINGS—29 parts, 490 pieces, mostly distance pieces for stationary turbine blades.

Brass

BRASS CASTINGS—4 parts, 22 pieces, small parts for sight-flow oil indicators.

BRASS TUBING—2 parts, 48 pieces, for oil spray pipes.

BRASS ROD—7 parts, 34 pieces, mainly nuts, bolts, and bushings.

SHEET BRASS—3 parts, 18 pieces, name plates, pointers, and vanes.

STRIP BRASS—47 parts, 205 pieces, for joint and labyrinth gland strips.

Bronze

COMPOSITION "A" BRONZE—20 parts, 83 pieces, for bushings, disk nuts, nozzles, oil catchers, and plugs.

TOBIN BRONZE—37 parts, 143 pieces, special and forged dog-screws.

Copper

SHEET COPPER—5 parts, 45 pieces, mainly washers and grommets.

Glass

GLASS—2 parts, 24 pieces, for sight feeds and peep-holes, in oiling system.

Iron

CAST IRON—93 parts, 194 pieces, turbine casings, reduction gear and thrust bearing housings, reduction gear centers.

WROUGHT IRON—4 parts, 28 pieces, for internal oiling systems.

Monel Metal

MONEL CASTINGS—4 parts, 36 pieces, for valve disks.

MONEL ROD—51 parts, 1,040 pieces, mainly for forged turbine blades, and tap bolts.

Steel

STEEL CASTINGS—2 parts, 3 pieces, for lifting straps, and steam chest.

MILD STEEL—78 parts, 1,452 pieces, for bolts, studs, and forged flanges.

O. H. STEEL—143 parts, 1,607 pieces, for bolts, studs, nuts, and nozzle rings.

NICKEL STEEL—1 part, 4 pieces, for studs.

SPECIAL ALLOY STEEL—25 parts, 34 pieces, for stage wheels, reduction gear rims, and pinions.

Purchased Parts

STAGE WHEELS—21 units.

REDUCTION GEAR RIMS—4 units.

PINIONS—4 units.

KINGSBURY THRUST BEARINGS—2 units.

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Should the Machinery Industries Speak With One Voice?

IF INDUSTRY is to be called together often, as it was on December 5, who is to speak for the machinery industries? Before that question can be answered there must be answers to two other questions: Is it possible for one individual to speak for all of the machinery industries? If it is possible, is it desirable?

Before such a thing is possible there must be some sort of co-operation between and organization of the various groups of machinery builders. Some of them are very closely knit; others just the opposite. Under the leadership of Ernest F. DuBrul, general manager of the National Machine Tool Builders' Association, efforts have been made during the last two years to effect some kind of an organization of machinery trade associations, but without too much success.

Some men think that such an organization would be productive of good results. Others look upon it as just one more association in a field that is overloaded with societies, institutes, and associations. Before much can be accomplished these divergent views must be reconciled. Perhaps the best way to do this is to get them expressed in cold type. The *American Machinist* stands ready to publish opinions on the question and will welcome from its readers any thoughts that will help clear it up.

*

Good Foremen a World-Wide Need

LEADERSHIP is vitally essential to progress, whether of a nation or of advance in production methods and output. East or West, the same elements make for success. Industry and skill are both necessary, but without leadership there is much lost motion and progress is slow.

Just as we in the United States are realizing the importance of leadership in the shop, so those who are responsible for production in shops in Japan and the Far East are finding that they must have good foremen if they would secure the proper output from their machine equipment. Factory managers well versed in western ways report that while the workmen of the East are both diligent and skillful there is a sad lack of men who can or will assume responsibility.

With this universal need for good foremen comes the problem of selecting men with qualities that may develop into leadership and of the methods to be used in training them for the work. It is quite possible that in the past we have unduly stressed manual skill as an asset in picking foremen, whereas it may easily prove a handicap instead. For instead of teaching the workman how to do the job, the highly skilled foreman too often does the difficult job himself. Leadership includes the willingness to take responsibility, and responsibility must be given to develop real foremen. It is better to let the foremen make a mistake occasionally than to compel him to consult a superior before making every decision.

*

Free Silver and False Prophets

IN THE recent fall of metallic silver to an all-time low, there is food for honest speculation. And there is reason for an I-told-you-so satisfaction in the minds and hearts of all who opposed William Jennings Bryan and his thories in 1896. What, one can almost hear them saying to themselves, would now be the plight of the United States if money were being coined in the ratio of sixteen silver dollars to one of gold? With silver below 47 cents per fine ounce, it is not too hard to picture the genuine distress which might now be rampant.

That such might be so, leads one to reflect upon the far-reaching consequences of following false prophets. That what might be so is not actually so, can be attributed either to the good common sense of the American people or to the good luck which seems to guide and guard their destiny. At least they rejected one false prophet, and they may some day throw overboard one or two more.

*

PRESIDENT Hoover's principal concern, ever since the first premonitory rumblings in Wall Street, has been to prevent immediate unemployment. His efforts are apparently successful, but how successful no one knows because no machinery to get accurate information on the extent of unemployment has as yet been set up. Means to that end should be devised.

SHOP EQUIPMENT NEWS

Rivett No. 104-5 Turret-Type Internal and External Grinder

TO GRIND a part which must be absolutely concentric at one chucking, a turret-type grinding machine having an external and an internal spindle has been placed on the market by the Rivett Lathe & Grinder Corporation, Brighton, Boston, Mass. The two-station turret is mounted on the cross-slide of the machine and carries a low-speed spindle for external grinding and a high-speed spindle for internal grinding, both spindles being driven in turn from the spindle bracket driving pulley, as shown in Fig. 2. A removable endless canvas belt is applied to the spindle to be driven, and is changed over to the other pulley when the turret is indexed. The other spindle is at rest during grinding to avoid unnecessary vibration and danger from a free running wheel. The turret is indexed conveniently by a spring-loaded indexing pin with pull-out handle at the front of the turret housing.

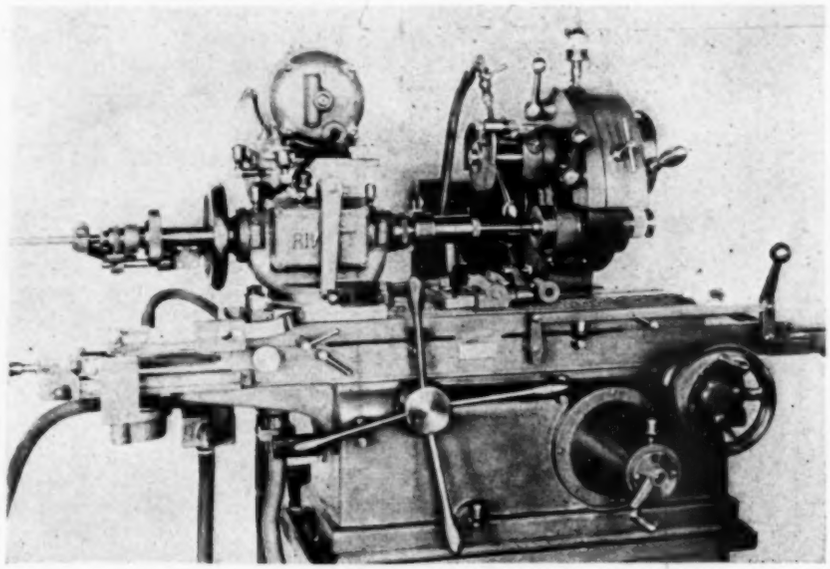


Fig. 1—Rivett No. 104-5 Turret-Type Grinding Machine, which is equipped with an internal and an external spindle

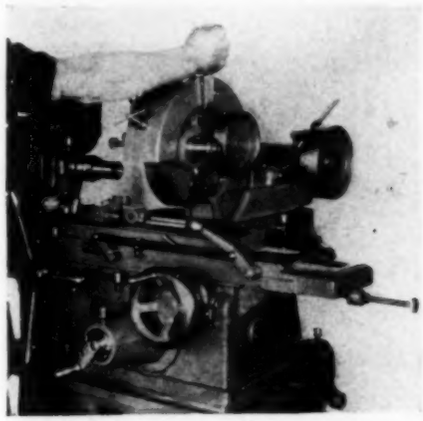


Fig. 2—Showing the method of indexing the turret. The endless belt, not shown, must be changed to the driven pulley on the spindle wanted

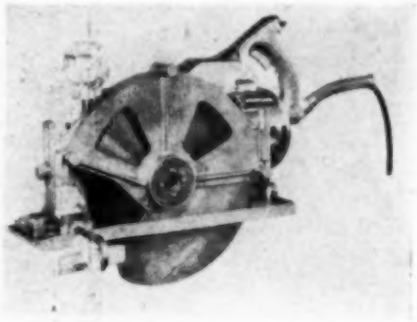
The grinder is motor driven, carrying the motor on the workhead, and the main motor drive is located on the back for the power table reciprocation, the water pump, and the grinding spindle drive. The reciprocation of the table is accomplished through the Rivett heart cam movement, which insures rapid and convenient adjustment for the length of stroke. The machine is furnished with both an automatic headstock stop and start control, and an automatic water control. The power table reciprocation is engaged by movement of the ball handle at the right-hand end of the table, and feeding of the grinding wheel is controlled by the graduated cross-slide handwheel.

"Speedway" Types 183 and 184 Portable Electric Saws

The Types 183 and 184 portable electric saws manufactured by the Speedway Manufacturing Company, 1834 South 52nd Ave., Cicero, Ill., are made with 12- and 10-in. blades, respectively, to take $4\frac{1}{8}$-in. and $3\frac{1}{8}$-in. cuts. The first machine has a 1-hp. motor operating at 1,750 r.p.m. and the second a $\frac{3}{4}$-hp. motor operating at 1,800 r.p.m. Both of these saws operate on either a.c. or d.c. circuits.

Features common to both saws are described below. The swinging saw guard pushes back out of the way when the cutting pressure is applied and returns to the guarding position the moment the pressure is released. This action is automatic. In case the operator should desire to hold the guard in the sawing position, an arrangement is provided for this purpose. The upper portion of the saw blade is covered with a guard of cast aluminum, the side cover of which may be removed quickly for changing blades.

Ball bearings are used throughout the saw, and all gears and shafts are made from heat-treated, chrome-nickel steel. Spur and bevel gears are employed instead of worm gears. Gears and bearings are grease-packed.



"Speedway" Portable Electric Saw

The saw blade is mounted on the

left side of the machine to give maximum visibility to the operator. The blade is driven through a flange. On both models a ripping guide is mounted on the front of the slipper plate to facilitate long cuts. Both models are equipped with a D-type handle, which is adjustable to two positions. Cast aluminum is used for the motor cases, handles, and slipper plates. The weight of the Type 183 saw is 28 lb., and that of the Type 184 saw is 25 pounds.

Crocker-Wheeler Types C and S Speed Changers

Speed reducers and increasers with the mechanism built onto the rear end of standard motor frames are now manufactured by the Crocker-Wheeler Electric Manufacturing Company, Ampere, N. J. These speed changers work by the adhesion of hard, ground, steel surfaces rolling upon each other and brought together by forces that insure driving without slip. These forces vary by means which are inherent in the operation of the mechanism itself, and two distinct types have been developed, the Type C and the Type S speed changers.

The Type C consists of a heavy cylindrical shell within which on the horizontal axis are three cylindrical rollers lying with their axes in a horizontal plane, and embraced by a ring whose interior surface is also ground in cylindrical form. In Fig. 2, *A* is the driving roller, *B* the driven roller, *C* the idler roller, and *D* a ring embracing the three rollers. These rollers and the ring are made of heat-treated and hardened steel. The inside diameter of the ring is slightly smaller than the sum of the diameters of the three rollers so that at all times the driving roller is pressed against the driven roller with a force that depends on the stiffness of the ring and its fit upon the rollers.

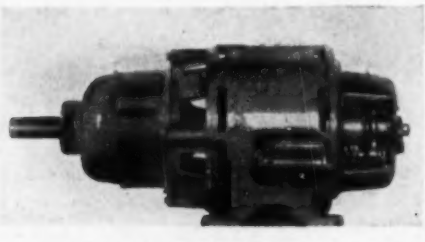


Fig. 1—Crocker-Wheeler Type S Speed Changer combined with a d.c. motor

The pressure exerted by the ring on the three rollers is caused to vary by the load itself to the extent needed to secure transmission of the power without slipping. The pressures are not transmitted through the bearings which support the three rollers, but are applied by the ring itself acting upon the three rollers through their lines of contact. The linear velocity of the surfaces of all three rollers

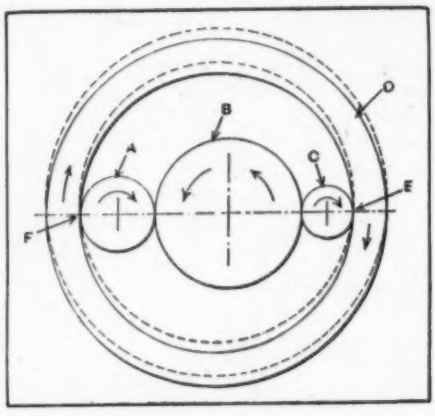


Fig. 2—Diagram showing action of the Type C Speed Changer

and the interior surface of the ring are the same, irrespective of their relative diameters.

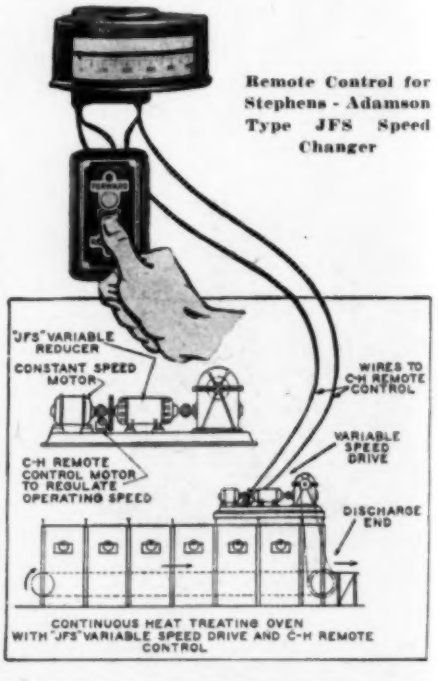
In the S type reducer, instead of three rollers side by side, a central roller or shaft is used, surrounded by three planetary rollers of equal size, housed in a cage or retainer. The central shaft is the high-speed member and the planetary rollers and cage are the low-speed member. The latter are surrounded by a stationary ring system which works as follows:

The rollers have a double-opposed cone formation in the middle. The ring system consists of two parts, which fit together by contact of inclined surfaces, and which are ground to a fixed radius, so that each ring contacts with one of the cones on the rollers. One of the rings is prevented from rotation by three pins inserted in the housing and the other ring is free to turn except for its contact with the first ring at the inclined surfaces. On turning the center shaft, the planetary rollers turn also, and react on the free ring to an amount proportional to the torque to be transmitted. They thus attempt to turn it relatively to the fixed ring. This small turning of the two rings causes them to climb up on the inclines and thus exert a compression on the whole interior system. Driving is therefore secured without slip. This movement is proportional to the load transmitted. The free ring moves up the inclines as the load increases.

All speed changers are provided with three pipe plugs for lubrication, one at the top for filling, one below the center, and one at the bottom. The speed reducers of the "C" type range from capacities of 1½ hp. in a 2:1 ratio operating at 1,750 r.p.m., to 50-hp. units in a 5 to 1 ratio operating at 690 r.p.m. The S type reducers range from 1-hp. sizes operating at 1,750 r.p.m. and being of 4 to 1 ratios, up to 20-hp. sizes in 5 to 1 ratios, operating at 690 rev. per minute.

Remote Control for Stephens-Adamson Speed Changer

By merely pushing the forward or reverse button of this electrical control for the Type JFS speed changer, the operator can increase or decrease the speed of conveyors or other machines from a remote point. The JFS variable-speed reducer is manufactured by the Stephens-Adamson Manufacturing Company, Aurora, Ill. Ordinarily, the speed is regulated by means of a handwheel, but, when the drive is overhead or located in a crowded corner, the control becomes difficult. When the push-


"JFS" VARIABLE REDUCER
CONSTANT SPEED MOTOR
WIRES TO C-H REMOTE CONTROL
VARIABLE SPEED DRIVE
C-H REMOTE CONTROL MOTOR TO REGULATE OPERATING SPEED
DISCHARGE END
CONTINUOUS HEAT TREATING OVEN WITH "JFS" VARIABLE SPEED DRIVE AND C-H REMOTE CONTROL

Remote Control for Stephens-Adamson Type JFS Speed Changer

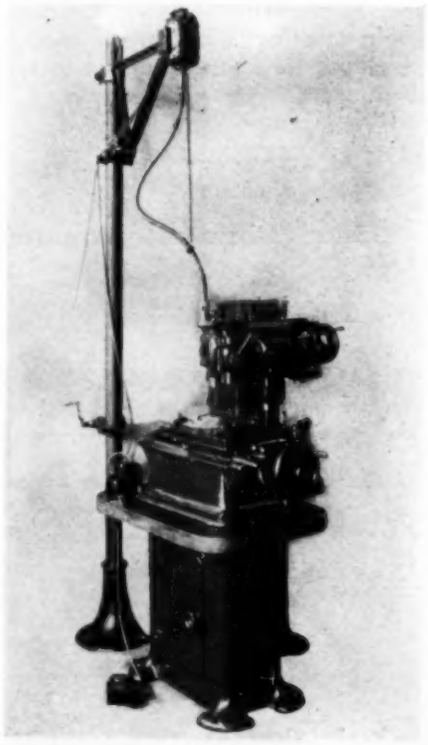
buttons are located at some distance from the machine, the electrical tachometer is used to show the speed accurately.

The usual control handwheel is replaced with a spur gear driven forward or backward by means of a compact control motor mounted on the base. The push-button box can be located at any distance from the drive and the speed is increased or decreased by simply pressing on the proper button. As long as the increase button is pressed, the JFS unit continues to increase its output speed. When the desired speed is reached, the button is released and the rotation remains constant until a new speed is wanted.

Approximately one minute is required to change the speed from one extreme to the other. For example, the output speed of the JFS reducer driven by a 1,200 r.p.m., 3-hp. motor can be changed from 24 to 144 r.p.m. in slightly less than one minute.

Hauser No. 2 Jig Boring Machine

A JIG boring machine that will perform boring, drilling, locating, and center punching has been introduced into the United States by the Index Machinery Corporation, 49 Central Ave., Cincinnati, Ohio. This machine is built by Henri Hauser, S. A. Bienne, Switzerland. Its capacity is 8x12 in. with a maximum vertical movement of 12 in. The jig borer depends for its accuracy on the use of screws. The slides are operated by micrometer screws, the drums of which are divided into hundredths, while verniers enable reading to .0001 inch. Wear in the screws is hardly perceptible, as the screws are employed only to bring the various attachments into the required positions. When the machine is in operation, the screws and nuts are not in use. Adjustments are made through fiber handwheels.



Hauser No. 2 Jig Boring Machine

The drums are adjustable on the screws so that they can be set to zero at the start of the work. The screws mounted in the slides are completely covered, protected against dust or accident. End play is eliminated by the use of counterweights. When the machine is not in use, these counterweights are released by the shifting of a lever, thus taking the strain off the mechanism. The micrometer screws are carried in hardened steel bushings and are hardened where they rotate in these bushings.

The manufacturer guarantees that the maximum error of displacement of the slides does not exceed .0005 in., while the tools supplied with the machine are interchangeable with a maximum difference of .0001 in. The division of the standard scale has no error exceeding .0002 inch. The standard scale certificate indicates to 0.00005 inch.

A cupboard for tools is built into the base of the machine. The casting for the table is stiffened by a number of ribs and has six T-slots. The table can be clamped in any desired position. Transverse and longitudinal slides are exactly perpendicular according to the claims of the manufacturer.

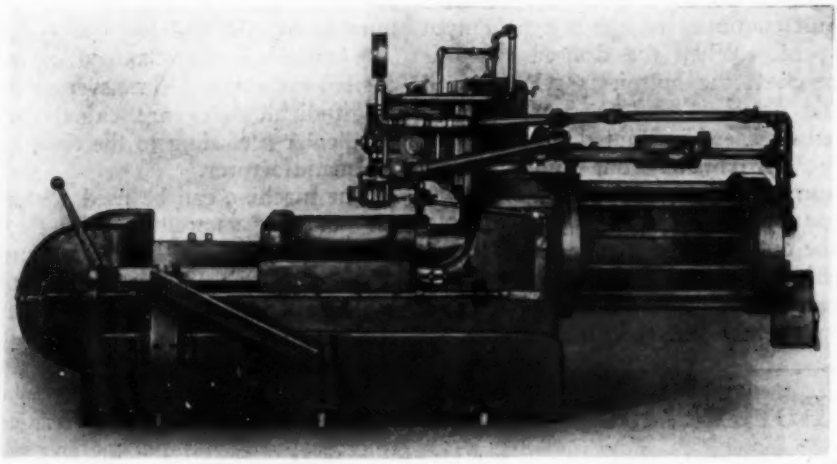
The machine can be used for center punching as well as drilling, the holder for the punching device and microscope being adjusted vertically by a rack and pinion. The boring tool and toolholder are co-axial. A locating microscope, which is used for controlling and measuring, magnifies 30 times. The goniometric microscope, used for angle measurement, magnifies 20 times. Its ocular has a revolving and a fixed thread, a graduated circle, and a vernier providing readings in 2 min. The center punch device is controlled by a weight, and after punching returns to its original position. It is co-axial with the drilling and boring fixture, the arbor of which is adjustable, its thrust being taken by adjustable ball bearings.

Drive is from a variable-speed motor through a flexible shaft suspended above the machine. The drilling spindle has a vertical travel of $2\frac{3}{4}$ in. Up to $\frac{3}{4}$-in. holes can be bored with accuracy. Special end mills may be supplied for the quick opening and sizing of holes. The depth of a hole is determined through a scale.

The working surface of the table is $9\frac{7}{8}$ by $17\frac{3}{16}$ in. A circular table 11 in. in diameter is also furnished, and is divided into half-degrees. A vernier movable in either direction permits readings to 2 min. Through a calibration scale and microscope, the accuracy of the machine can be checked periodically. The standard scale is 12 in. long and is divided into tenths.

"American" 75-Ton Bulldozer

ESPECIALLY designed for track assembly work, a 75-ton bulldozer has been developed by the American Broach & Machine Company, Ann Arbor, Mich. This machine is mounted on a base having roller bearings, so that the entire machine has an opportunity to float, making it self-centering. Two arms on the side of the base carry a bar. This bar has depressions that receive rolls and pins. The side bars to be assembled pass on either side of this bar along fixtures held in place against the jaws. The side bar offering the least resistance to being pressed onto the pins and rollers will advance until it strikes the stationary cross bar and then the other side bar will advance. This feature permits



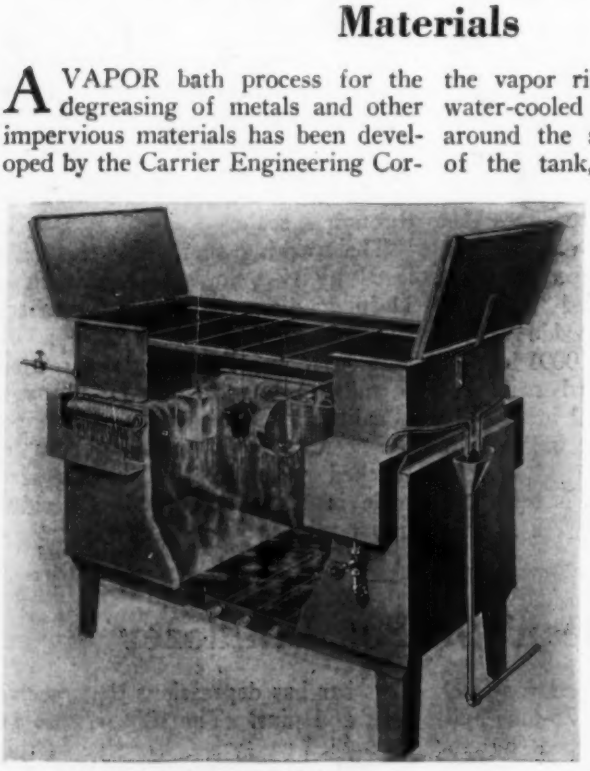
"American" 75-Ton Bulldozer, which has been developed especially for track assembly work

of progressive assembly on a fixed straight line, with resulting economy in manufacture.

The jaws are 24 in. wide and 6 in. deep. A floating vise is employed, which carries the motor and pump mounted on a plate connected to the cylinder. The ram has a forward speed of 8 ft. per minute and a return speed of 11 ft. per minute. Complete with sub-base, the machine weighs 12,000 pounds.

Carrier Vapor Degreaser for Impervious Materials

A VAPOR bath process for the degreasing of metals and other impervious materials has been developed by the Carrier Engineering Corporation of Newark, N. J. In this process a solvent known by the trade name of "Cecolene" is boiled and vaporized. When used in the standard tank form of the apparatus, the vapor rises to the level of the water-cooled condenser coils placed around the sides and near the top of the tank, is condensed, and is precipitated to the bottom of the tank. Since the vapor has a density more than three times as great as that of air, there is no tendency to overflow or escape.



Carrier Vapor Degreaser for Non-Porous Materials

The objects to be degreased are suspended in the vapor, which condenses on their cold surfaces at once and runs off profusely, carrying with it all grease. The objects are kept in the vapor until they attain its temperature, in from 1½ to 3 minute, the time depending upon the gage or weight of the metal or other material. They are then removed in a warm, perfectly dry, and clean state, any foreign matter remaining being in the form of dust, which is easily removable.

The objects being degreased do not come into contact with grease previously removed from other material, since the solvent vaporizes at a temperature much lower than the grease, which remains in the liquid below. Economy results from the fact that the chlorinated solvent can be used over and over, the vapor never becoming "dirty."

The unit is made in standard dip tank units and in special designs adaptable to any size or style of continuous conveyor in line assemblies, and to steam, gas, or electric heating. Cecolene is a blanket term for a group of chlorinated solvents adaptable to various uses and materials.

Obvious uses for this device are the degreasing of metal stampings, die castings, bolts and nuts, metal furniture, metal lacquerware, hardware of many kinds, motor parts, kitchenware, dishes, leather belts, brakebands, articles of glass, Bakelite, celluloid, and many other products requiring a cleaning of grease before finishing or packing. The apparatus is neither complicated nor costly and the Cecolene fluid can be used over and over. By the insertion of diversion condenser plates, the tank can be used for the rectification of Cecolene and other cleaning fluids, also.

Cloth and porous fabrics cannot be degreased in the vapor, but anything can that is impervious enough to permit the condensed fluid to run back into the reservoir.

"Thor" Rotary Pneumatic Grinders

The Independent Pneumatic Tool Company, 600 West Jackson Boulevard, Chicago, Ill., has developed a line of pneumatic grinders based on the rotary principle. The features

Fig. 1—"Thor" No. 260G Pneumatic Grinder, which operates at 4,300 rev. per minute

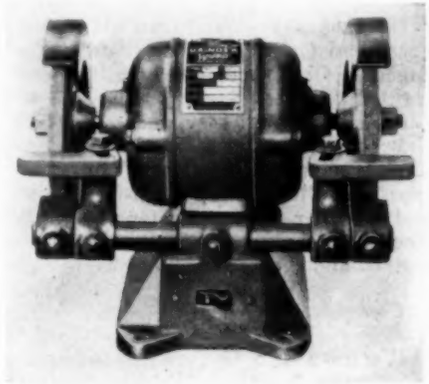
Fig. 2—"Thor" No. 00 Pneumatic Grinder, which runs at 28,000 rev. per minute

are light weight, governed speed, increased power, and lack of vibration. Due to the rotary principle, the air consumption and upkeep cost are low.

Two of the "Thor" grinders are illustrated, Nos. 260G and 00. No. 260G, shown in Fig. 1, has a speed of 4,300 r.p.m. and carries an 8-inch elastic-bonded wheel or a 6-in. vitrified wheel. Weight is 13½ lb. No. 00, shown in Fig. 2, has a speed of 28,000 r.p.m., and is particularly adapted for touching up dies. It carries a 1¼-in. elastic-bonded wheel and various pencils, sticks, or special shapes. The weight is 2¾ pounds.

Wappat "Red Streak" Bench-Type Grinder

A portable electric bench grinder has been developed by Wappat Incorporated, 7524 Meade St., Pittsburgh, Pa. It is designed for general grinding purposes and tool sharpening. While it is light enough to be moved conveniently, it is of sturdy construction and powerful.



Wappat "Red Streak" Bench-Type Grinder

The two 6-in. grinding wheels are covered with adjustable safety guards, thus making it possible to grind at any position on the circumference of the wheels. The grinder is balanced. The switch is located at the base, making operation easy. A rubber-covered cable with attachment plug and two adjustable toolrests are supplied. The motor operates on 110- or 220-volt, a.c. or d.c. circuits. The machine may be bolted to the table when desired, but the vibrationless operation makes this unnecessary.

Olsen Cable and Wire Testing Machines

A CABLE testing machine and a wire testing machine have been developed by the Tinius Olsen Testing Machine Company, 500 North 12th St., Philadelphia, Pa. The first of these, illustrated in Fig. 1, is of the company's standard universal type, but it involves a number of improvements over earlier models, and was developed especially for steel cable testing. It is fitted with a change speed gearbox drive, which

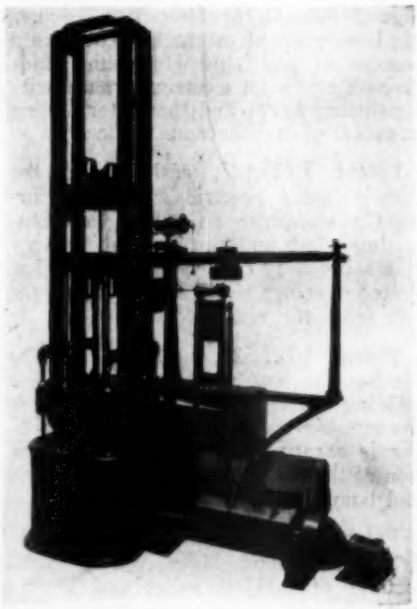


Fig. 1—Olsen Cable Testing Machine, which has a capacity of 400,000 pounds

permits the selection of eight different speeds, and starts, stops, and reverses by means of clutches. Earlier machines of this type were fitted with open gears. A "tell-tale" inter-connected with the gearbox shows which gears are in mesh. The gears are shifted by means of the four levers shown in the foreground of the above figure. As required in a machine of this capacity, the entire design is of very sturdy construction.

Movement of the head is indicated directly on a graduated dial reading to 0.01 in. This enables the operator to determine elongation by the movement of the gripping head. The head movement is transmitted directly to an indicating drum that rotates in proportion to this movement. A second movement is imparted to the recording pencil by the poise. These combined movements develop an automatic, autographic, stress-strain diagram, indicating the behavior of the sample under strain. The maximum capacity of this machine is 400,000 pounds.

The second and smaller of the two machines, shown in Fig. 2, is known as a standard wire testing machine. It is fitted with a two-lever, four-speed gearbox control, in which the drive to each gear is through small metal-to-metal, hardened-steel, disk clutches. These clutches make it possible to change from one speed to another as quickly as desired without stopping the machine. The change can be made from any speed to any other speed selected. The use of these clutches is a novel feature and makes the operation of the machine a simple matter.

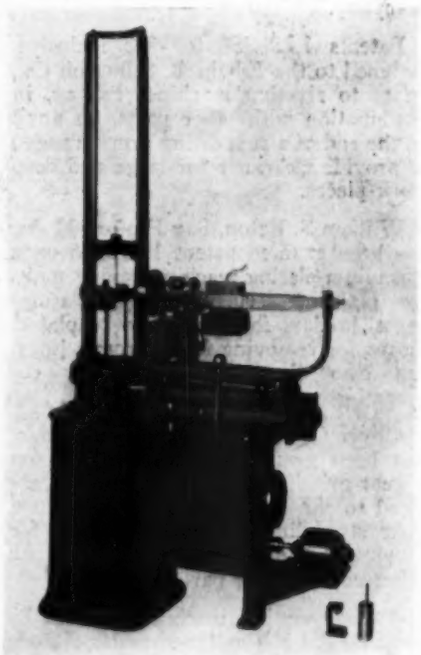


Fig. 2—Olsen Wire Testing Machine, which is fitted with clutches to permit rapid changing of the speeds

REVIEW · OF · RECENT · PATENTS

Relating to the Machinery and Metal Products Industries

Metal-Working Machines

A machine for boring non-circular holes is the subject of patent 1,730,429, granted to Irving C. Jennings, of South Norwalk, Conn., and involves the combination of a toolholder on a cross-slide, a cam to be connected to or mounted on the work, and means for causing the cross-slide to follow the cam contour.

A screw-milling machine having a cutter with a plurality of milling faces, a plurality of chucks adapted to holding blanks, and means for moving chucks to and from said cutter in timed relation is the subject of patent 1,731,036 granted to Jean Francois Arnold of Juvisy, France.

To Louis T. Knocke, Detroit, Mich., has been granted patent 1,731,051 on a centrifugal casting machine comprising a rotatably mounted mold cap, a mold body on a tubular shaft, a plunger fitting the tubular shaft for ejecting castings, and other co-operating parts.

A balancing machine having a yieldingly supported bed resting upon a movable fulcrum, means on the bed for mounting the rotating body, and means for counter balancing the unbalanced movement and for adjusting such counter balancing means, is covered by patent 1,731,357, assigned to the Westinghouse Electric & Manufacturing Company.

Patents 1,731,358 to -362 inclusive, assigned to the Edwin B. Stimpson Co., relate to riveting machines having, in combination with other parts, an anvil on the end of a supporting arm arranged to provide clearance for large and deep work pieces.

William S. Eaton, Sag Harbor, N. Y., has been granted patent 1,731,456 on a chromium plating machine having tanks for cleaning-, rinsing-, and plating-baths, holders for articles to be plated, means for removing fumes from a housing over the tank, and other co-operating parts.

Oliver G. Simmons, Lakewood, Ohio, has been granted patent 1,731,505, on a gear-grinding machine having a gear fixed to the spindle, a rack fixed to a yoke straddling the spindle, means for moving the yoke along a guideway, and other co-operating parts.

A rivet setting machine, covered by patent 1,731,399 assigned to the Edwin B. Stimpson Co., combines an anvil with a remote support rising from a column at the end of an arm and other co-operating parts.

A shaft-straightening machine, which is provided with a vertically movable striker that has actuating means mounted below the table, is the subject of patent 1,722,841, assigned to the Wyman-Gordon Company.

The combination in a straightening machine of a centering mechanism for the work, a straightening means, and a lever for controlling the action of said mechanisms, is the subject of patent 1,731,650, assigned to the Perkins Machine & Gear Company.

Processes

To Sven Emil Sieurin and Alfred Sigurd Edlund, of Hoganas, Sweden, has been granted patent 1,726,001, on a process of purifying aluminum oxide by melting in an electric furnace with a reducing agent and thereafter adding an excess of carbonaceous reducer.

Patent 1,725,127, assigned to the Westinghouse Electric & Manufacturing Co., relates to a flexible gear, comprising a hub and rim brought together at a spherically curved joint which has slotted openings to permit detaching the hub from the rim.

Patent 1,725,523, assigned to The Mechanical Rubber Co., relates to a yielding connection of rubber between the metallic walls of a cavity. The rubber is arranged to resist relative motion of the metallic parts both vertically and laterally.

Patent 1,731,117, granted to Henry E. Warren, Ashland, Mass., relates to the method of making gears and similar small bodies by punching laminations from a moving perforated ribbon, each lamination being pressed directly into contact with a preceding lamination to form a stack and then uniting all the laminations.

The process of sharpening tools with numerous fine cutting edges, by passing an electric current from an electrode to the tools through a solution of copper sulphate, sulphuric acid, borax, and acetic acid, is the subject of patent 1,721,414, assigned to the Rekeen Tool Company.

The Gleason Works is assignee of patents 1,726,051 and 1,726,091, covering two methods of producing gear teeth. The first relates to curved tapered gear teeth made by cutting two side tooth surfaces simultaneously in an intermittent indexing operation with a rotary mill. The second patent relates to cutting hypoid gear tooth surfaces with a reciprocating tool while the gear blank is given a rolling movement.

Materials

A coating for molds, which contains particles of chromium, a woven organic material, and an oxidation inhibitor, and which is adapted to form a homogeneous surface material alloyed with a base-material, is the subject of patent 1,725,039, assigned to the Electro Metallurgical Company.

Patent 1,725,445, assigned to the General Plate Co., relates to a plate with gold surface portions on a backing of copper-aluminum alloy, that is capable of attenuation by cold rolling or drawing. The backing contains from 2 to 10 per cent of aluminum.

A dipping solution for producing an adherent colored coating on metal articles, and containing a soluble molybdate and a soluble fluorine compound, is the subject of patent 1,723,067 granted to Aladar Pacz, of East Cleveland, Ohio.

TRADE PUBLICATIONS

CENTERLESS GRINDERS. Cincinnati Grinders, Incorporated, has published a booklet on the Nos. 3 and 4 centerless grinders of its manufacture, giving the construction, typical jobs handled, features on special jobs, and the specifications. The catalog contains 11, 8½ x 11-in. pages.

HOPPERS FOR CENTERLESS GRINDERS. Cincinnati Grinders, Incorporated, Cincinnati, Ohio, published a bulletin entitled "Labor Saving Hoppers for Cincinnati Centerless Grinders," which shows four types as follows: The floor level type, the "Feed-Matic" thru-feed type, the "Feed-Matic" in-feed type, and a hopper for feeding tapered work. Each attachment is thoroughly described and the specifications are listed.

WELDING AND CUTTING NOMENCLATURE. The American Welding Society, 33 West 39th St., New York, N. Y., has published a booklet entitled "Welding and Cutting Nomenclature, Definitions and Symbols." The text is divided into four sections: Section I, nomenclature; Section II, definitions of general welding terms, processes, forms of joints, forms of welds, and equipment and supplies; Section III, abbreviations, and Section IV, symbols. Copies may be obtained for $0.50.

NEWS
OF THE WEEK

Automobiles in Annual Show Stress Operation and Appearance

Smarter bodies and engines with more cylinders feature this year's exhibit—countless refinements lend novelty and improve appearance

ADDITIONAL cylinders and a number of body refinements seem to be the aims of most automobile manufacturers as the 1930 Automobile Show opens in the Grand Central Palace, New York. A number of brand-new eights, some in fact only a month or two old, and the Cadillac "V-16", 16-cylinder custom-built model reflect the efforts of the car makers to satisfy a public which has been taught to value a car to a large extent by the number of cylinders it possesses. Also evident is the effort to gain a low appearance and sweeping lines, demonstrated in the longer and higher hood lines, diverse louver designs, convertible bodies, longer and flatter fender lines, smaller wheels, and similar effects.

An additional reason for the increasing number of cylinders is the demand for more power and speed with greater smoothness. Other important tendencies are the use of four-speed gearsets, front-wheel drives, superchargers, vacuum-operated brakes, radios, improved manifolds, oil filters, chromium-plated ware, and other changes. The majority of the changes are, however, merely refinements of previous applications designed to enhance the easy-riding qualities or general appearance of the cars.

Aside from the increases in number of cylinders, there are few important changes in automobile power-unit design, or in the remainder of the chassis, if front-wheel drives are excluded. A combination of circumstances has brought about the increase in the number of cylinders. The advantages of keeping reciprocating parts light and small as well as the gain in having more power impulses per revolution are two of the major ones, as well as the increased ease of selling models with a greater number of cylinders. To increase power, as well as to increase maximum speed, and the necessity of keeping weight down, have been contributing factors as well. More care is being exercised in the balancing of crankshafts and other rotating parts, mounting engines on rubber cushions, more careful design of combustion chambers, better manifolding, and preparation of the fuel mixture before combustion, correct location of spark plugs, better cooling of pistons, valves, and other parts, and the use of smaller cylinders have all aided in minimizing vibration, and consequently, in improving riding qualities.

The increased use of four-speed gearsets has come about largely because such an arrangement allows an engine to run at lower speeds for given car speeds and still have the necessary pulling ability. With these gearsets, the lowest speed is usually only for emergency work, and the third, or next-to-top, speed is made almost as quiet as the direct-drive top speed. In most cases, the gear-shifting arrangement is similar to the shift on a three-speed arrangement.

Clutches are not much altered. Spring or fabric-rubber hub mountings are being used more and more extensively as cushioning devices. Better provisions for ventilation and allowance for expansion are being incorporated in the newer clutches. Rear axles have undergone very little change. Housings have been strengthened, bearings are better arranged, and oil leakage has been lessened. Spiral bevel gears still dominate in this field. "Steering modulators," or other cushioning devices are being used on steering gears to greater and greater extent, the effort again being to increase driving comfort. All in all, the 1930 model has a greater output, smoother performance, greater riding and driving comfort, greater safety, decreased fuel consumption, lower maintenance cost, and more minor refinements than its predecessors.

* * * *

American Business Touches High Levels Despite Recessions in Some Lines

By Robert P. Lamont
U. S. Secretary of Commerce

AMERICAN business in 1929 reached higher levels than ever before, notwithstanding recessions in some lines in the later months. Measured by quantities, not value, the output of our manufacturing industries broke all previous records, being 8 per cent higher than in 1928. Mineral production shows precisely the same percentage of gain, and here, too, a new high level was established. Freight carloadings rose by 3 per cent. Employment in manufacturing industries and the amount of wage payments were both considerably greater in 1929 than in the preceding year.

Commodity prices have been steady, with a slight downward tendency. There has been no undue accumulation of stocks of goods. Dividend payments of industrial and public-utility corporations were about 20 per cent greater than in 1928. There was a decline of 7 per cent in failures among industrial and commercial concerns, as measured by the amount of liabilities; this may be considered a dependable indicator of the general soundness of business.

The only important branch of business showing less activity in 1929 than the year before was construction—the decrease in new contracts being very largely confined to residential building.

The solid economic progress that I have indicated was not in any sense the result of a "boom." Its very substantial character helped greatly to alleviate the effects of the marked break in prices of stock-exchange securities during October and November.

The most important single indicator of economic activity is the index of the output of the manufacturing industries. This showed an increase of approximately 20 per cent over 1923—a very active year. There was a strong demand during the year for coal and for the metals. This increased production of mineral and manufactured commodities was reflected—as I have already mentioned—in a larger movement of railway traffic.

Automobile production last year reached about 5,500,000 units, by far the largest output ever attained. Although the closing months showed a greater seasonal decline than usual, the very large production during the other months brought about an increase, for the year as a whole, of 27 per cent, as compared with 1928. The exports of automobiles have rapidly increased, reaching a peak total in 1929.

While there was some advance in the general level of wholesale prices in 1928

over 1927, the year 1929 showed a slight recession. This was not the result of any sudden break. During most of the individual months, even when factories and mines were most active, the prices were somewhat lower than in the corresponding period of 1928. Increase in industrial efficiency accounts both for the greater output and the general downward tendency in prices.

Exports of American manufactured goods reached the huge total of approximately $3,250,000,000, about 9 per cent greater than in 1928, and about 80 per cent more than in 1922. This growth of exports has made possible more continuous employment of American labor and capital. Import trade was also exceptionally large, especially when allowance is made for the recent decline in the prices of certain major important commodities. The large volume of imports is the result of our high purchasing power and of the increasing productive capacity of many foreign countries.

Although some of our industries lagged behind, there was on the whole, during 1929, less disparity between slow and active branches of business than has been apparent in other recent years.

Broadly speaking, the business history of 1929 recorded the continuation of a movement which has been substantially unbroken for an exceptionally long period. It is impossible, of course, to forecast what temporary ups and downs may occur. But the nature of the economic development of the United States is such that one may confidently predict, for the long run, a continuance of prosperity and progress.

* * *

Gray Iron Institute Plans Series of Meetings

In carrying out its policy of meetings with foundrymen in the important foundry centers throughout the country, the Gray Iron Institute announced recently the first of a series of meetings. Arthur J. Tuscany, manager of the Institute, made the announcement. These meetings will take place in the midwestern territory and will start in the form of a luncheon attended by gray iron foundrymen of the district. The balance of the afternoon will be given over to Institute affairs, discussions of various activities in which the Institute is engaging, and an explanation of the cost system recently made available for the industry. The Institute is assisting members of the different territories to form local chapters through which chapters the work of the organization can be applied to individual problems in the various districts. The last of these chapters to be formed is the Buffalo unit. The series of meetings planned included the following centers: Cincinnati, Chicago, Milwaukee, Twin Cities, Central Illinois, St. Louis, Kansas City, and a general Iowa meeting. Following this series, similar meetings will be held in other sections of the country.

Fred H. Colvin Honored By Japanese Engineers

SHORTLY before leaving Japan, Fred H. Colvin, who was delegate to the World Engineering Congress in Tokyo, was invited to a meeting at the Navy Club that to his surprise turned out to be a testimonial dinner given in his honor by engineers and manufacturers of Tokyo and vicinity. Among those present were representatives of the Army, Navy, and other governmental departments, professors from the Imperial University of Tokyo, and engineers, managers, and owners of well-known machine-building plants.

Vice-admiral Makoto Saito (retired) addressed the gathering in both Japanese and English, stating that the engineers of Japan had known Mr. Colvin for many years through his writings in the *American Machinist* and elsewhere, especially through the *American Machinists' Handbook* and the *Aircraft Handbook*, and were pleased greatly at the opportunity of meeting him face to face as a result of the World Engineering Congress. He stated that they felt that much of their knowledge of modern machining methods and much of their development along mechanical lines had been due to Mr. Colvin and his writings and that they were glad to honor him in this way. Admiral Saito said that they desired constructive criticism rather than praise and hoped that such criticism would be freely given. Each engineer then rose and gave his name and business connection. Many mentioned specific articles and books that had helped them, several being particularly interested in both the Executive Forum and the Foreman's Round Table.

In response, after expressing appreciation of the honor conferred, which was doubly gratifying to one 8,000 miles from home, Mr. Colvin stated that he was glad that both he and the *American Machinist*, with which he had been so long associated, had been helpful to their friends in Japan.

The engineers then presented Mr. Colvin with a scroll commemorating the happy occasion, containing the signatures of each one present in both Japanese and English.

* * *

General Steel Builds Large Foundry

A foundry, the main bay of which is 996 ft. long by 270 ft. wide, with cranes having 90-ft. spans and 100-ton capacities, is being built by the Eddystone division of the General Steel Castings Corporation at Eddystone, Pa. Locomotive frames, 65 ft. in length, with cylinders cast integral, will be one of the products of the new foundry. They will be cleaned in a 70-ft. sand-blasting room, to which they will be transported on flat cars.

* * *

Die and Tool Builders Elect New Officers

New officers for the National Die & Special Tool Builders' Association, 40 North Wells St., Chicago, were announced recently by George R. Tuthill, secretary, M. P. Heinze of the Heinze-Petzelt Machine Co., was elected president. R. Krasberg, of the Krasberg Tool & Manufacturing Co., was elected vice-president. Geo. R. Tuthill continues as secretary, and Miles Irmis of the Superior Tool & Stamping Co. becomes treasurer. Directors elected were Franz K. Krag, Alex F. Hillstrom, H. A. Laystrom, Irvin S. Berkmann, M. C. Bachner, S. R. Swenson, Daniel Szantay, John Winzler, Wm. F. Orth, Christ Scheel, and T. E. Barker.

* * *

Schrader Valve Company Sold to Scovill

A. Schrader's Son, Inc., Brooklyn, N. Y., maker of tire gages, wrenches, valves, and similar parts, employing about 2,000 men, is to be acquired by the Scovill Manufacturing Co., subject to the approval of stockholders. This information was given out last week by E. O. Goss, president of the Scovill Company. The stock will be purchased from trustees.

* * *

Curtiss Plane Wins Grand Safety Prize

Formal announcement that the Curtiss Tanager, entry of the Curtiss Airplane & Motor Corporation, had triumphed in the Guggenheim international safe aircraft competition, organized and sponsored by the Daniel Guggenheim Fund for the Promotion of Aeronautics, was made on Jan. 1, by Capt. E. S. Land, vice-president and active head of the fund in the absence of the president, Harry F. Guggenheim, Ambassador to Cuba. The first prize of $100,000 was awarded to the Curtiss Corporation several days later. The Handley Page entry received second prize.

Twenty-seven designers and manufacturers entered planes in the competition. As the constructors faced problem after problem in the building of a plane that would pass all the requirements laid down for the contest, one by one they dropped out until only 15 were presented for the qualifying tests. Of the 15, six withdrew and six others failed to meet the requirements. One other entry failed in the preliminary tests and was not resubmitted.

Latin-American Trade Impressive But Conditions Are Uncertain

By Paul Wooton

Washington Correspondent American Machinist

TAKEN as a whole, 1929 was one of the record years in the history of Latin-American trade. It was a better year than 1928, which was one of great commercial activity. Had it not been for the abnormal year of 1920, the year just closed doubtless would have established a record.

Although the year's totals are impressive, the fact must be faced that 1929 ended with a shroud of uncertainty extending over business from the Rio Grande to the Straits of Magellan. This was a result of a variety of causes. Some of them were economic; some of them were political. Of chief economic importance was the crash in coffee prices. This has a very depressing effect on general business in Brazil, Colombia, Venezuela, Costa Rica, Guatemala, Salvador, Nicaragua, Haiti, and Ecuador.

Another factor tending to depress general business is the world petroleum situation. With the efforts now being made to check over-production there has been a slowing down in operations of that type. Latin-America also has suffered as a result of the speculative excesses in the United States. It was the world situation growing out of that phenomenon that made it so difficult for the Coffee Institute to secure adequate financing and which paved the way for the break in coffee prices. In a number of the countries, poor judgment has been shown in connection with public works programs. Although the outlook is not particularly roseate at this writing, there is no serious undermining of public confidence either in Latin-Amerііca or in those countries which deal with Latin-America in a large way.

The latest available figures covering the trade with South America are for the ten months ending in October. During the first ten months of 1929, the export trade between the United States and South America amounted to $464,322,881. This shows an increase over the corresponding period of 1928, when the total was $388,292,703. The exports to Cuba for the first ten months of the year just closed amounted to $109,833,793. This is a slight increase over 1928, when the figure was $105,022,213. The exports to Mexico in 1929 were approximately the same, the total being $109,027,275. For the first ten months of 1928, the total was $96,062,444. The value of the exports to Central America for the same period was $77,229,896. This compares with a total of $65,790,869 in 1928. Business with the Dominican Republic fell off slightly from exports to the value of $13,783,536 in 1928 to $11,976,161 in 1929.

Imports to the United States from South America during the first ten months of 1929 were valued at $544,242,331. This is an increase over the corresponding period of 1928, when the figure was $478,158,577. During the first ten months of the year just closed, Cuba sent commodities to the United States to the value of $185,441,751, as compared with $176,779,403 for the corresponding period of 1928. Goods to the value of $101,053,098 were imported into the United States from Mexico during the ten months ending with October, 1929. This represents a slight decrease, as compared with the first ten months of 1928. Exactly the same situation existed in respect to Central America. Those republics in the first ten months of 1929 had exports to the United States of $38,957,095. This is slightly over $1,000,000 less than the total for the same period of 1928.

* * *

New Equipment Keynote Of Management Congress

A comprehensive picture of modern industrial practices, covering management, production, and distribution, will be presented at the National Management Congress at the Stevens Hotel, Chicago, March 3 to 5. The meeting will be a co-operative one consisting of members of the following societies: Society of Industrial Engineers, American Society of Mechanical Engineers, American Management Association, National Association of Cost Accountants.

Eight sessions have been planned beginning Monday, and sufficient diversifactions of subjects have been included to cover major industrial endeavors. There will be sessions on waste elimination; distribution; mechanization in the administrative field; budgeting; plant maintenance; wage incentive plans; industrial managership training; and management and production control. Authorities in each field will present papers and opportunity will be afforded for discussion.

During the same week and in the same building, the National Industrial Equipment Exposition will be held, portraying a vivid cross-section of equipment, supplies, and services to be found in the management field. The exhibits in the exhibition hall of the Stevens Hotel will offer modern facilities for inspection of latest methods.

* * *

Loening Organizes Air Research Plant

Grover Loening, pioneer engineer and designer of planes and amphibians and founder with his brother of the Loening Aeronautical Engineering Corporation, announced recently that he had resigned as consulting engineer and director of the Keystone Aircraft Corporation and director of the Curtiss Wright Corporation to start the Grover Loening Co., of which he is president and chief engineer. He intends to specialize in the development of new and advanced designs in aircraft under contract for both the government and private manufacturing companies. A new laboratory and plant for building his experimental planes has been established at 305 East 46th Street, New York City.

* * * *

United States Signs Pact Planned To Liberate Trade

THE United States Government and 18 other important trading countries joined in signing, on Dec. 20, the protocal bringing into active operation the convention of the League of Nations for the removal of more than 200 import and export obstacles which now prevent the easy flow of commerce from one country to another. The accomplishment was achieved not without long and delicate negotiations, which at one period brought the conference to the verge of collapse. Other countries whose delegates affixed their signatures were: Austria, Belgium, Denmark, Finland, France, Germany, Great Britain, Northern Ireland, Italy, Japan, Luxemburg, The Netherlands, Norway, Portugal, Rumania, Sweden, Switzerland and Jugo Slavia.

When the convention comes into effective application on July 1, 1930, American products will move across the borders of the signatory states with greater ease, and those states which have erected barriers in the form of contingent quotas will have to take measures to modify or remove them. This may expedite the export of American films and motor cars. For foreign exporters, the path to U. S. markets will be similarly smoothed out, especially in regard to essential raw materials and semi-manufactured articles.

The United States is one of the eight countries which ratified the convention unconditionally, thereby showing willingness to abolish restrictions regardless of the attitude of Poland and Czecho Slovakia, who have as yet refused to enter into the convention. Unless these two countries ratify it before July 1, eleven signatories will withdraw. This leaves, however, both Great Britain and Japan committed to the agreement with the United States.

BUSINESS · BAROMETER

Business is on an even keel, with the stock market liquidated and prospects good for the spring

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

THE calendar divides the year into certain periods whose beginning and ending are milestones by which we try to measure our progress. The measurements thus made are entirely misleading, for we progress at variable rates of speed and sometimes we go much faster than we do at others. It is difficult to reconcile these inequalities of progress. They are probably a result of physical and mental conditions. The man who is already wearied by excessive effort cannot go as fast as the runner who is fresh, and the student who has been sitting up all night to prepare for an examination cannot stand a second ordeal of the same kind without a breakdown or a rest.

But when we come to consider a nation of 120,000,000 persons or a world that is inhabited by 1,800,000,000 people, these generalizations do not apply. Taken as a whole, the mental and physical condition of the earth's population probably varies but little. The World War, which involved most of the Nordic race, was an exception, but the recovery from the strain was remarkably prompt, and the economic progress achieved since the Armistice has been amazing.

Therefore, there would seem to be but little in the business outlook to cause any concern. Another great war is unlikely in the near future, and science and finance appear to have joined hands in an effort to make the forces of nature the servants of man.

Just now business seems to be upon an even keel. It is said that the American stock market is liquidated. Of course, it is never liquidated, as someone must always hold the stocks, but what those who talk about liquidation mean is that the stocks are now held by those who are able and willing to keep them, and that compulsory selling is unlikely.

Taken as a whole, commodity prices are, if anything, below the cost of production, and if precedent has any value whatever, staple products ought to be cheap at present quotations.

The output of steel, which during the holidays reached the lowest point in several years, will now increase again, and cheaper money favors the expected revival in building. The automobile manufacturers are planning an early increase in production, though they will move cautiously as compared with the same months last year. Ford is going to spend thirty million dollars to enlarge and develop his plants in this country. For the first eleven months of 1929, he manufactured more than one-third of all the automobiles and trucks produced in the United States, and his recent sales are said to be on the ascending scale.

A report issued by the Federal Reserve Board indicates that 423 department stores in 229 cities showed an increase of one per cent in their November sales, and in the New York district December sales were two per cent larger than those of a year ago. This ought to dissipate the fear that everyone would be compelled to stop buying because of stock-market losses. The mail-order houses announce substantial gains in their December sales.

Net railroad earnings for November and gross earnings for December are below last year's record-breaking figures, but assuming a pick-up in industry after its seasonal curtailment, it looks as if spring traffic will be satisfactory.

In the commodity markets nothing of moment has occurred, but the steadiness of prices is construed by most traders as evidence that the bearishness of the statistics in certain cases has been fully discounted. Silk already seems on the way up. Cotton, rubber, and sugar are all a shade better. And even in coffee, the supply of which is one of the largest that has ever been accumulated in any commodity, a sharp rally has been staged with the aid of Brazilian support.

In Europe, the outlook is encouraging, although France seems reluctant to meet the views of England and the United States in limiting her armament. It is, however, undeniable that the sentiment in favor of peace is increasing and while the feeling may change over night, the year commences auspiciously.

In China and India, more or less unrest is reported. The Chinese government demands the abolition of extra-territorial rights, and the Indian reformers are insisting upon a dominion status for the 400,000,000 people that they claim to represent. No immediate outbreak or revolution is expected, and the great powers of the Occident seem disposed to recognize the demands that are being made. The question is not so much one of principle, but of time and opportunity.

Taking the world as a whole, and as far as business and politics are concerned, the outlook would seem to be normally tranquil, and in the United States the prospect for a good spring trade is brightening. Spots of depression are, however, noticeable. The cotton goods trade is one of them. So is the business in woolen goods, but with these two exceptions the demand seems to be fully equal to the supply, and if there is any slackening of activity its reason will be psychological rather than physical.

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From this page the reader will get a quick picture of current business and industry. The boxed material below is a summary of the letters from regional correspondents of the American Machinist, published in full on the opposite page.

SATISFACTORY levels in machinery and machine-tool sales are reported by dealers from all parts of the country, with the possible exception of Detroit, where the recent slump in automotive production is still being felt. Little if anything of importance has developed in any of the centers, the past week being devoted mainly to a proper observance of the arrival of the new year. No change of great extent is expected in the situation until after the January meetings of the executive boards of the larger companies. Present sales are mainly replacement items. No big lists have been released for several weeks. Inquiries are increasing steadily, and point to a goodly volume of general business before the year is many months old. The used-tool market is satisfactory.

NEW YORK business is expected to equal that of 1928 during the coming year. The week's sales were for replacement. Cincinnati business is at a satisfactory level, with the orders of the past week for single items mainly. Canadian dealers are optimistic, with sound conditions throughout the country and business picking up. New England reports a dull December, with the inquiry list causing a good deal of optimism. Indianapolis reports good demands from radio, farm implement, and aviation factories, largely for small tools. Chicago expects some road, farm, and tractor machinery orders soon. Detroit reports little improvement, with a turn for the better expected to come in February or March. Present orders are for replacement.

THE INDUSTRIAL REVIEW

Weekly progress of the machinery and machine-tool business

THE following reports, gathered from the various machinery and machine-tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

NEW YORK

Little, if anything, of importance has developed in the machinery and machine-tool market in the New York district during the last week. The year-end holiday, coupled with the usual business cessation during that week, has allowed few orders to be closed. Towards the end of the week, business picked up considerably, but no volume of orders is expected until the new budgets are closed toward the middle and end of the month. Orders are expected in an increasing scale all through the first quarter; beyond that, few predictions are being made. The year's business is expected to equal that of 1928, a good year. No one expects it to equal that of the year just closed.

Business is for no particular class of machines, or from no particular industry. No lists have been let. One of the larger dealers reports better sales in other districts than in New York for the year just closed, and attributes this seeming lassitude to the intensity with which general business watched the ticker throughout the first part of the year. In the slump that followed, the machine-tool market had little interest, no falling off of any proportions having been noticed in this district. The remainder of the year continued on approximately the same scale, closing out in a fashion unexpected by dealers. It was generally much higher than even their fondest expectations. The coming year bids fair to exceed expectations as well.

CINCINNATI

Considering the season, the great majority of the machine-tool manufacturers of the Cincinnati district report business at a satisfactory level during the past week. Market conditions were normal for the period of the year.

The sustaining business feature of the past year was the sale of single tools to small users, with here and there an order for two or three pieces of equipment. While in the coming year the aggregate buying of small users is expected to be fully as large as in the previous year, this volume, it is expected, will be greatly increased by more liberal buying on the part of larger users, including the railroads.

In the past week, the sales of the manufacturers were well scattered and well diversified, and while there were some orders for two or three tools, the great majority were for single pieces of equipment. Among the week's inquiries there were a few from railroads, none of these large, the majority being in regard to single tools. The greater portion of the inquiries were from miscellaneous users, located in all sections of the country, whose requirements were single tools and replacements.

Selling agents report that business continued at a normal level during the week, with inquiries coming in freely. Many encouraging features are seen by this branch of the trade, and it is thought that a fine volume of business is developing in local adjacent territory, among all classes of users.

CANADA

Machinery and machine-tool manufacturers in Canada look forward to the coming year with a feeling of confidence and optimism. Conditions throughout the country are sound. Construction generally is at a high peak; the operations of the mining and paper and pulp companies are on a larger scale than ever before; the railways have planned large expenditures on new equipment and rolling stock, while new waterpower undertakings will involve an expenditure of close to $100,000,000, a goodly proportion of which will be for construction machinery and equipment.

Orders have just been placed by the Canadian-National Railways for 30 new locomotives. The Montreal Locomotive Works will build 12 mountain-type engines for passenger service, and the Canadian Locomotive Co., will build 18 of the Santa Fe type for freight. The railway also announces that it has inquiries out among locomotive manufacturers for the delivery of 151 Santa Fe type locomotives and 151 mountain-type locomotives.

The outlook for the steel industry is highly promising. The steadily rising tide of industrial activity, which reached its peak during the first nine months of 1929, has been reflected in an unprecedented demand for the primary forms of iron and steel. Rail mills have been working virtually at capacity for some months, a situation which is expected to exist throughout the winter. Other metal-plant prospects are good also.

NEW ENGLAND

December showed New England machine-tool builders and dealers a dull month, with sales below those of November. The month was outstanding in that it was the one month of the twelve in which it was not generally conceded that sales had surpassed totals for the corresponding month of 1928.

The week was encouraging, with a relatively heavy inquiry list. No large purchases for machine tools were noted. Metal-working plants were chief buyers, with placements for one or two tools. While business was fairly well scattered as to industries, this was the principal source, with Connecticut dealers sharing in orders for rebuilt equipment. Machinery sales other than machine tools were noted in the paper, shoe, and textile fields.

Leaders are not looking forward to a repetition of 1929 in 1930. It would be unreasonable to expect a third year of record-breaking endeavors in the machinery field. Buying by the automotive industry is expected to be slow through the first quarter. Although good business is expected from the aeronautical field, the industry will experience a period of drastic readjustment. Overproduction is apparent. There are many new concerns in the field, and some of these have not produced beyond the experimental stage.

CHICAGO

With inquiries increasing in volume, and machine-tool plants of the Middle West producing in most cases at capacity, the outlook for 1930, as voiced by machinery executives, is satisfactory. It is generally believed, however, that there will not be any definite upward trend until late in January, possibly not until February, when industrial plants will have had their annual overhauling, budgets have been prepared and replacements of obsolete equipment or installation of new machinery have been decided on. Among those expected to be among the early buyers of shop equipment are builders of road machinery, who are quoted as confidently looking forward to an increased demand for their products in view of the announced highway extension projects, state and national. It is regarded as fairly certain that by the end of January, makers of farm machinery and tractors will be in a position to make known their requirements in the line of machine tools, railroads being expected to come into the market a little later on. Manufacturers of automobiles and auto accessories, as production increases, will again become active buying factors. Demand for used tools, while not comparable with that of two months ago, is increasing. Deliveries are steadily improving, orders now being filled in a month that last fall required three months or more.

DETROIT

The new year so far has brought no improvement to the machinery and machine-tool business in Michigan. Conditions are as unfavorable as they were during the weeks immediately preceding the holidays. Most of the automobile plants are re-hiring men, and the general atmosphere is optimistic. Production schedules of the automobile companies are not high, and the plans for the year do not point to a large volume. In general, it is believed that the total output for 1930 will be substantially lower than that for 1929. It also seems certain that this production will not get fairly under way until February or March. The machinery and machine-tool dealers are selling most entirely replacement equipment. It is predicted that this will constitute a large share of the year's business. Cost-cutting machinery will also be important, as manufacturers are more than ever intent on cheaper production.

The situation among the contract jobbing shops is poor. Most of the shops are either idle or nearly so. General business conditions are still below normal. There is some unemployment and this, of course, has had a strong influence on the business situation.

INDIANAPOLIS

Little change is seen in the demand for machine tools and machinery in this section. Business is somewhat spotted, and the trade is not looking for any change until the middle of the present month, when prospects appear better than usual. A large number of inquiries is being received, the wide number of sources from which they come being encouraging to the trade.

Railroad demand is being held to absolute requirements, but these requirements are heavier than they were a year ago. Shops in this section have been employing more men during the last two weeks. Some demand for special tools has been had from the farm implement factories, which is expected to increase during the present month.

There has been a continued demand for small tools from the airplane industry. The large number of additional airports that are contemplated in this state will keep this demand growing, it is believed. Small lathes, grinding machines, and similar tools are being purchased.

A good demand continues from the radio industry. This is particularly for woodworking machinery used in the manufacture of cabinets. There is a good demand also for special machinery from the furniture factories.

Business Items

The Foundry Equipment Co., 1831 Columbus Rd., Cleveland, Ohio, has acquired the industrial oven department of the Swartout Co., 18511 Euclid Ave., according to a recent announcement by Charles A. Barnett, president of the former company. The Swartout technical staff is being retained, under the direction of Carl F. Mayer. Julius Tuteur is chairman of the board of the Foundry Equipment Co., O. D. Conover is vice-president, A. B. Cannon, secretary, and A. F. Woehrmann, treasurer.

The plant of the Stuebing-Cowan Co., Holyoke, Mass., now owned by the Yale & Towne Manufacturing Co., Stamford, Conn., is being moved to Philadelphia, where it will be quartered in the establishment of the Miller Tool Co., also recently purchased by Yale & Towne. The Cincinnati plant of Stuebing-Cowan and also the Canadian branch of that organization, are being continued at their former locations.

The Dominion Wheel & Foundry Co., Ltd., Toronto, and the Anthes Foundry Co., Ltd., Toronto and Winnipeg, will establish plants in Calgary, Alta. The Dominion Wheel & Foundry Co. has purchased 13.6 acres immediately south of the Dominion Bridge plant, and work on the construction of the foundry will commence in the spring. The city has sold 6.57 acres to the Anthes Foundry Company.

The Leon Hommel Machine Works, Oakland, Calif., has established a department specializing in aeronautical machine work.

Extensive alterations are being made in the equipment of the Dominion Tire Factory, Kitchener, Ontario. Much of the present machinery is being replaced by newer and more efficient units, which are expected to increase the plant's output. The new machines will use an additional 900 horse power.

The Houdaille-Hershey Corporation, Detroit and Buffalo, has acquired an interest in the Schwitzer Cummins Co., Indianapolis, manufacturer of automobile engine and pump parts. The Oakes Products Corporation, a division of Houdaille, has moved its Indianapolis and Detroit equipment to the new plant in North Chicago.

A branch office of the Gardner-Denver Co., Denver, Col., has been opened at 38 North Guthrie St., Tulsa, Okla. More than 4,500 ft. is available for warehousing. J. F. Ward is office manager.

The Franklin Hardware Co., 37 Howard St., New York, will be located at 50-52 Franklin St., between Broadway and Lafayette Sts., after Jan. 18.

Concentration of all George D. Roper Corporation industrial activities in one building will be realized when the plant completely occupies its new million-dollar factory on Blackhawk Ave., Rockford, Ill. In this building, 400 x 450 ft., with 180,000 sq.ft. of floor space, all industrial production activities will be centered. The factory will employ about 600 workmen. Mabon P. Roper is president of the corporation, and H. J. Gilbert, works manager and vice-president.

Personals

JOHN E. BARKLE has been promoted to works manager at the South Philadelphia Works of the Westinghouse Electric & Manufacturing Co., according to a recent announcement by E. R.

Norris, general works manager. Mr. Barkle was educated at Dickinson College and joined the Westinghouse organization in 1901. For a number of years he occupied important positions in the manufacturing department. In 1919, he was made service engineer. He became superintendent of all Westinghouse service shops throughout the country in 1921 and was promoted to assistant superintendent of the power department in East Pittsburgh in 1923. In 1926, he was promoted to superintendent of generating apparatus, which position he held until his appointment.

HARRY A. SCHWARTZ, manager of research, National Malleable & Steel Castings Co., Cleveland, has been selected to receive the 1930 major award of the American Foundrymen's Association, the John A. Penton Gold Medal. This award, which is made to Mr. Schwartz for his outstanding contributions to the foundry industry, has been approved by the board of awards and will be presented to him at the 1930 convention the week of May 12. Mr. Schwartz is especially noted for his contributions to the field of research on malleable iron.

I. J. REUTER, president and general manager of the Olds Motor Works, Detroit, has been assigned to take over the General Motors Adam Opel Motor Works, Russelheim, Germany. D. S. EDDINS, vice-president and general sales manager, has been appointed general manager to succeed Mr. Reuter. Mr. Reuter is not permanently assigned to the Opel factory, and so retains the presidency of the Olds organization. J. I. Collins has been appointed general sales manager to succeed Mr. Eddins. J. J. Carter, factory manager, who will accompany Mr. Reuter, will be succeeded by G. M. Bernard.

T. W. FRECH, vice-president of the General Electric Co., has been granted a year's leave of absence to become president of the RCA Radiotron Co. G. C. OSBORN and W. T. L. COGGER have resigned from the General Electric Company to become associated with the RCA Radiotron Co. as vice-president in charge of sales and vice-president in charge of manufacturing respectively. J. E. KEWLEY has been appointed acting manager of the incandescent lamp department. M. L. Sloan has been appointed assistant manager, and E. E. V. Potter has been appointed general sales manager of the Edison division of the department.

EDWARD G. BUDD, JR., has been appointed purchasing agent of the Edward G. Budd Manufacturing Co., Philadelphia. Following his graduation in 1923 from Wesleyan University, Mr. Budd spent two years in the Budd company shop. Since that time he has worked in the Citroen automobile plant, Paris, in the plant engineering department and in charge of production of automobile doors at the Budd plant. He succeeds C. W. Messinger, present assistant treasurer of the company, as purchasing agent.

WILLIAM CRANE BABBITT has been added to the staff of the Industrial Truck Association, 52 Vanderbilt Ave., New York City, as field engineer. He will make field surveys of handling methods in the foundry and metal-working fields in the near future. Mr. Babbitt is a graduate of the University of Michigan and has had ten years' experience in the management of industrial plants and in the trade association field.

FRANCIS G. ECHOLS has been made president of the Greenfield Tap & Die Corporation, Greenfield, Mass., succeeding FREDERICK H. PAYNE, who becomes chairman of the board of directors. Mr. Echols joined the company in 1919 as vice-president and general manager, having previously been with the Pratt & Whitney Tool Co., Hartford, Connecticut.

HARRY J. BROOMHALL, former secretary and treasurer of the Master Craft Corporation, Kalamazoo, Mich., has resigned to become assistant secretary-treasurer of the General Steel Castings Corporation, Eddystone, Pa. He was Pacific coast representative of Remington-Rand, Inc., prior to assisting in the organization of the Master Craft Corporation in 1928.

J. H. BELKNAP was recently appointed manager of the control engineering department of the Westinghouse Electric & Manufacturing Co., East Pittsburgh. He succeeds E. B. NEWILL, who resigned to become assistant to the president of the Delco

Products Co., a subsidiary of General Motors Corporation.

G. Douglass Morse has been appointed New England representative of the Westcott Chuck Co., Oneida, N. Y., with offices at 24 Milk Street, Boston. The company recently opened an office at 25 Church St., New York, under the direction of P. R. Paulsen.

L. R. Nourie, Park Building, Pittsburgh, has been appointed district engineer in northern West Virginia, eastern Ohio, western Pennsylvania, and Alleghany and Garrett counties in Maryland for the Despatch Oven Co., Minneapolis.

John C. Allen, chief mechanical engineer at the New Castle Works of the Carnegie Steel Co., Carnegie Bldg., Pittsburgh, Pa., has been appointed assistant general superintendent, according to a recent announcement by R. J. Tully, general superintendent.

John M. Davie, 2453 Overlook Road, Cleveland Heights, Cleveland, Ohio, has been appointed representative of the General Manufacturing Co., Detroit, for the territory of western Pennsylvania and northern Ohio, excepting Toledo and suburbs.

John D. Lannon has been elected vice-president and general manager of the Brockway Motor Truck Corporation, Cortland, N. Y. He was also made a director and a member of the executive committee.

H. V. Blaxter, director of the Woodard Machine Co., Wooster, Ohio, and chairman of the board of the Mackintosh-Hemphill Co., Pittsburgh, has been elected director of the Union National Bank, Pittsburgh.

W. W. MacMillen, purchasing agent for the National Malleable & Steel Castings Co., Cleveland, has been made chairman of the Iron and Steel Committee of the National Association of Purchasing Agents.

J. E. N. Hume has been appointed assistant manager of the industrial department of the General Electric Co., and has been succeeded by C. F. Pittman as manager of the motor division of the industrial department.

Allen E. Chester, formerly research engineer with the Union Oil Co. of California, has joined the sales staff of the Watson-Stillman Co., 75 West St., New York, N. Y. Mr. Chester will be located in the New York office.

Myron E. Forbes has resigned as president of the Pierce-Arrow Motor Car Co., Buffalo. He will remain a member of the executive committee and the board of directors.

Frederick P. Palen has resigned as vice-president of the Newport News Shipbuilding & Dry Dock Co., Newport News, Va. He has been with the company for the past 35 years.

H. A. Stevenson, 7310 Woodward Ave., Detroit, Mich., will represent the Lewis-Shepard Co., Watertown Station, Boston, Mass., in Eastern Michigan.

Obituaries

Wilfred Lewis, retired engineer, inventor, and manufacturer of Philadelphia and former president of the Tabor Manufacturing Co., of that city, died recently at sea near Egypt while on a world tour, according to a cablegram received by his son. Mr. Lewis was 75 years old and had been president of the Tabor Co. until a year ago. He was graduated from the Massachusetts Institute of Technology in 1875 and was assistant engineer and director of William Sellers & Co. from 1883 to 1900. In the latter year, he became president of the Tabor concern. In 1927, Mr. Lewis received the gold medal of the A.S.M.E., and in the same year won the Longstreth medal of the Franklin Institute for perfecting a shaking machine for molds used in casting. During the World War, he served in an advisory capacity in Washington and helped in the development of armored tanks. He was credited with being one of the world's greatest authorities on gears.

Wilhelm Maybach, 84, inventor of the straight carburetor, honey-comb radiator, and chain-speed gear which are still being used on automobiles, died at Stuttgart, Germany, on Dec. 30. He was head of the Maybach Motor Works, Friedrichshafen, which built the motors for the Graf Zeppelin. As chief constructor of the Deutz Motor Co., he invented the first gas motor with a benzine tank, as a co-worker with Gottleib Daimler, he built in 1900 the first Mercedes automobile which was equipped with his fourth important invention, the hot-tube ignition. He created the first Zeppelin motor in 1908.

Oramel W. Pierce, leading manufacturer of Olean, N. Y., and founder of the Roofing & Metal Works Co., of that city, died at his home on Dec. 29. He was also president of the Delavan-Pierce Corporation.

William H. Binder, 61, president of the Indiana Ornamental Iron & Wire Works, Indianapolis, Ind., died recently in that city. He had been an Indianapolis resident for 26 years.

Arthur E. Rudolphi, 60, founder and head of the Rudy Furnace Co., Dowagiac, Mich., died in his home in that city on Dec. 16, from heart disease. He organized the company in 1913.

Theordore A. Martin, superintendent of the Farrell Sheet Steel Foundry Co. plant, Sandusky, Ohio, died in his home in that city on Dec. 25.

Victor M. Johnson, for the past 25 years general manager of the Free Sewing Machine Co., Rockford, Ill., died recently in that city.

Willis A. Merrifield, 74, for 30 years identified with manufacturing industries in Freeport, Ill., but for the past 20 years proprietor of the Batavia, Ill., garage, died suddenly on Dec. 24 at Batavia. He was secretary-treasurer and later general manager of the Stover Manufacturing Co., Freeport, and was for several years associated with the Challenge Co., Batavia.

S. M. Neville, president and treasurer of the Leece-Neville Corporation, Cleveland, died unexpectedly on Dec. 28 at Fernandina, Florida.

Forthcoming Meetings

American Engineering Council—Annual Meeting, Washington, D. C., Jan. 9 to 11. L. W. Wallace, 26 Jackson Place, Washington, is secretary.

Society of Automotive Engineers—Annual meeting, Jan. 20 to 24, 1930, Book-Cadillac Hotel, Detroit, Mich. National headquarters are at 29 West 39th St., New York City.

American Institute of Electrical Engineers — Winter Convention, Jan. 27-31, headquarters at Engineering Societies Bldg., 29 W. 39th St., New York City.

American Society of Steel Treaters—Semi-annual meeting, Hotel Pennsylvania, New York City, Feb. 7 and 8, 1930. W. H. Eisenman, 7016 Euclid Ave., Cleveland, is secretary.

Engineering Institute of Canada—Annual meeting Feb. 12-14. R. J. Durley, 2050 Mansfield St., Montreal, Que., is secretary.

American Institute of Mining & Metallurgical Engineers — Annual meeting, Feb. 17-20, New York City. H. Foster Bain, 29 West 39th St., N. Y., is secretary.

National Management Congress—Stevens Hotel, Chicago, March 3 to 5. National Industrial Equipment Exposition in connection, March 3 to 7. G. E. Pfisterer, 308 W. Washington St., Chicago, is manager.

American Society of Mechanical Engineers — National Materials Handling meeting, March 5-7, Stevens Hotel, Chicago. Calvin W. Rice, 29 W. 39th St., New York City, is secretary.

American Society of Mechanical Engineers—Fiftieth Anniversary Celebration, Opens in New York, April 5, afternoon in Hoboken; April 6 in New York; April 7, 8, and 9 in Washington, D. C., at the Mayflower Hotel. Calvin W. Rice, 29 W. 39th St., New York, is secretary.

American Foundrymen's Association — Annual Convention, Cleveland Public Auditorium, Cleveland, Ohio, May 12-17. C. E. Hoyt, 222 W. Adams St., Chicago, is executive secretary-treasurer.

American Society for Testing Materials—Annual meeting, Haddon Hall, Atlantic City, N. J. June 23-27. C. L. Warwick, 1315 Spruce Street, Philadelphia, is secretary-treasurer.

THE WEEKLY PRICE GUIDE . . .

Rise and Fall of the Market

FIRMNESS in iron prices is indicated in the limited stocks now remaining at melters' plants. Railway buying and automotive demand exert a steadying effect on steel prices; most of the other steel outlets being in a state of apparently temporary dullness. Railway demand is the best in five years and automotive steel buying shows a slow but perceptible increase in volume. Steel mill operations average 38½ per cent of capacity, against 55 per cent, a year ago. This is considered as being not far below the seasonal normal. Most of the non-ferrous metals hold at last week's prices. Slab zinc, however, is weak and there is also a declining tendency in dealers' offerings for scrap zinc, copper, lead, and brass.

(All prices as of Jan. 3, 1930)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b:

CINCINNATI	
No. 2 Southern (silicon 1.75@2.25)	$17.69@$18.19
Northern Basic	19.90
Southern Ohio No. 2	19.90
NEW YORK—Tidewater Delivery	
No. 2 Southern (silicon 1.75@2.25)	19.50
BIRMINGHAM	
No. 2 Foundry (silicon 1.75@2.25)	15.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.76@22.26
Virginia No. 2	24.04
Basic	19.75@20.25
CHICAGO	
No. 2 Foundry, local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 1.75@2.25)	20.01
PITTSBURGH, including freight charge ($1.76) from Valley:	
No. 2 Foundry	20 26
Basic	20 26
Bessemer	20.76

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb:

Detroit	4.50
Cleveland	5.00
Cincinnati	4.50
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots:

Blue Annealed*	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.10@2.20	3.35	3.30	3.90†
No. 12	2.15@2.25	3.45	3.35	3.95†
No. 14	2.25@2.35	3.55	3.45	4.00†
No. 16	2.35@2.45	3.65	3.55	4.10†
Black				
Nos. 18 to 20	2.55	3.85	3.70	3.70
No. 22	2.70	4.00	3.85	3.85
No. 24	2.75	4.05	3.90	3.90
No. 26	2.85	4.15	4.00	4.00
No. 28	3.00	4.75	4.15	4.15
Galvanized				
No. 10	2.70@2.80	4.20	4.05	3.80
Nos. 12 to 14	2.80@2.90	4.30	4.15	3.90
No. 16	2.90@3.00	4.40	4.25	4.00
No. 18	3.05@3.15	4.55	4.40	4.15
No. 20	3.20@3.30	4.70	4.60	4.30
No. 22	3.25@3.35	4.75	4.65	4.35
No. 24	3.40@3.50	4.90	4.75	4.50
No. 26	3.65@3.75	5.15	5.00	4.75
No. 28	3.90@4.00	5.40	5.25	5.00

*Light plates. †Up to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. butt	53.74%	41.2%	55.5%	43.5%	55.5%	42.5%
3½ to 6 in. lap	50.32%	37.78%	53.5%	40.5%	51.6%	39.0%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches—External	Diameter in Inches—Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28
8	2.50	8.625	8.071	.277

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb:

Thickness—Decimal Fractions	B.w.g. and	Outside Diameter in Inches—Price per Foot— ½	⅝	¾	⅞	1	1¼	1½
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049"	18	.17	.18	.19	.20	.21	.23	.25
.065"	16	.19	.20	.21	.22	.23	.25	.27
.083"	14	.20	.22	.23	.24	.25	.27	.29
.095"	13	.21	.23	.25	.26	.27	.29	.31
.109"	12	.22	.24	.26	.27	.28	.30	.32
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33
.134"	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse base prices in cents per lb:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.25†	4.00	4.15
Cold rolled strip steel	6.25	6.00	6.10
Floor plates	5.10†	5.30	5.00
Cold drawn, round or hexagon‡	3.50	3.65	3.60
Cold drawn, flat or square‡	4.00	4.15	4.10
Structural shapes	3.30†	3.00	3.10
Soft steel bars	3.25†	3.00	3.00
Soft steel bar shapes	3.25†	3.00	3.00
Soft steel bands	3.75†	3.65	3.65
Tank plates	3.30†	3.00	3.10
Bar iron (2.75 at mill)	3.25	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, ¼-in. thick. †Up to 3,999 lb., ordered and released for shipment at one time. ‡Cold finished steel, shafting and screw stock.

Electric welding wire at New York warehouse— 3/32, 8.35c. per lb.; ⅛, 7.85c. per lb.; 5/32 to ½, 7.35c. per lb.

METALS

Warehouse Prices in Cents Per Pound for Small Lots:

Copper, electrolytic, New York			19.25
Tin, Straits, pigs, New York			43.50@44.50
Lead, pigs, E. St. Louis	6.10	New York	7.00@7.50
Zinc, slabs, E. St. Louis	5.45	New York	7.00@7.50

	New York	Cleveland	Chicago
Antimony, slabs	10.50@11.00	11.60	14.50
Copper sheets, base	27.75	27.75	27.75
Copper wire, base	20.12½	20.12½	20.12½
Copper, drawn, round, base	26.25	26.25	26.25
Copper tubing, base	29.25	29.25	29.25
Brass sheets, high, base	23.25	23.25	23.25
Brass tubing, high, base	28.25	28.25	28.25
Brass rods, high, base	21.25	21.25	21.25
Brass wire, high, base	23.75	23.75	23.75

SHOP MATERIALS AND SUPPLIES

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%.....	25@26	24.30	24.30
Zinc sheets (casks).....	10.75@11.25	12.25	10.11
Solder (½ and ½).....	30.25	29.75	28@30
Babbitt metal, delivered in case lots, New York, cents per lb:			
Genuine, highest grade.....			58.00
Commercial genuine, intermediate grade.....			42.00
Anti-friction metal, general service.....			31.00
No. 4 babbitt.....			11.50

NICKEL AND MONEL METAL—Price in cents per lb., base, f.o.b. Huntington, W. Va:

	Nickel	Monel Metal
Sheets, full finished.....	52.00	42.00
Sheets, cold rolled.....	60.00	50.00
Strip, cold rolled.....	55.00	45.00
Rods, hot rolled.....	45.00	35.00
Rods, cold drawn.....	53.00	40.00
Tubing.....	75.00*	90.00†
Angles, hot rolled.....	50.00	40.00
Plates.....	52.00	42.00

*Seamless. †Welded.

OLD METALS—Dealers' purchasing prices in cents per pound, f.o.b. cars:

	New York	Cleveland	Chicago
Crucible copper.....	14.25 @14.75	13.50	13.00 @13.50
Copper, heavy, and wire..	13.50 @13.75	13.00	12.25 @12.75
Copper, light, and bottoms	12.00 @12.25	12.00	11.25 @11.75
Heavy lead.....	4.50 @ 5.00	5.25	4.25 @ 4.75
Tea lead.....	2.87½@ 3.12½	3.25	3.25 @ 3.75
Brass, heavy, yellow.....	7.75 @ 8.00	8.00	7.25 @ 7.75
Brass, heavy, red.....	11.00 @11.50	12.50	10.25 @10.75
Brass, light.....	6.25 @ 6.75	7.00	6.25 @ 6.75
No. 1 rod-brass turnings.	9.00 @ 9.25	8.00	7.75 @ 8.25
Zinc.....	2.50 @ 3.00	3.00	2.00 @ 2.50

TIN PLATES—Charcoal—Bright—Per box:

	New York	Cleveland	Chicago
"AAA" Grade:			
IC, 14x20.....	$12.10	$11.95	$11.50
"A" Grade:			
IC, 14x20.....	9.70	9.90	9.50
Coke Plates—Primes—Per box:			
100-lb., 14x20.....	6.45	6.10	7.00
Terne Plates—8-lb. Coating—Small lots—Per box:			
IC, 14x20.....	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb..	$0.13*	$0.16	$0.15
Cotton waste, colored, per lb..	.09½*	.12	.12
Wiping cloths, washed, white, per lb.....	.12½	38.00 per M	.16
Sal soda, per lb.....	.02½	.02	.02
Roll sulphur, per lb.....	.028	.03½	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb.....	.159	.164	.159
Cutting oil, about 25% lard, in 5 gal. cans, per gal.....	.65	.60	.65
Machine oil, medium-bodied (55 gal. steel bbl.) per gal..	.33	.36	.24
Belting — Present discounts from list in fair quantities (½ doz. rolls) for leather or rubber:			
Leather—List price, 24c. per lin. ft., per inch of width, for single ply:			
Medium grade.....	30–10%	30–10%	35%
Med. grade, heavy wgt..	30%	30– 5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft:			
First grade.....	50%	50–10%	50%
Second grade.....	60%	60– 5%	50–10%

*Grade F.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars.....	per lb..	$0.0325	$0.0325	$0.0325
Cold drawn shafting...	per lb..	.035	.035	.034
Brass rods.....	per lb..	.2125	.2125	.1875
Solder (½ and ½).....	per lb..	.3025	.2975	.3475
Cotton waste, white...	per lb..	.13	.13	.10@.13½
Disks, aluminum oxide mineral, cloth, No. 1, 6-in. dia.....	per 100.	4.59	4.59	3.59
Lard cutting oil.....	per gal.	.65	.65	.65
Machine oil.....	per gal.	.33	.33	.30
Belting, leather, medium.....	off list..	30–10%	30–10%	30–10%
Machine bolts, up to 1x30 in., full kegs...	off list..	50-10%*	50–10%*	50%*

*List prices as of April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials — Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
Flint paper*.....	$6.03	$6.03	$6.03
Emery cloth*.....	25.87	25.87	25.87
Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100:			
Paper†.....	2.61	2.61	2.61
Cloth†.....	4.59	4.59	4.59
Fire clay, per 100 lb. bag.....	1.00	.75	.75
Coke, prompt furnace, per net ton.....	Connellsville, 2.60@2.65		
Coke, prompt foundry, per net ton.....	Connellsville, 3.50@4.8		
White lead, dry.....	100 lb. kegs ...	New York, 13.7	
White lead, in oil.....	100 lb. kegs....	New York, 14.2	
Red lead, dry.....	100 lb. kegs....	New York, 13.7	
Red lead, in oil.....	100 lb. kegs....	New York, 15.	

*Less than 3 reams. †Less than 200.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

Machine bolts:	
Up to ¾-in. x 6-in., full kegs, list less.....	60%
Larger, up to 1 x 30-in., full kegs, list less.....	50–10%
Less than full kegs or case lots, add to list.....	10%
Fitting-up bolts: list less.....	45%
Lag screws:	
Up to ½-in. x 6-in., list less.....	60%
Larger, list less.....	50–10%
Less than full keg or case lots, add to list.....	10%
Rivets:	
Structural, round head, full kegs, net.....	$4.50
Structural, round head, broken kegs, net.....	6.00
Tank, $\frac{7}{16}$-in. dia. and smaller, list less.....	60%
Nuts:	
Hot pressed, square or hexagonal, blank or tapped:	
Full kegs up to 1-in., incl., list less.....	60%
Larger, up to 3-in., list less.....	40–10%
Less than keg or case lots, add to list.....	10%
Washers:	
Wrought, full kegs, per 100 lb., list less.....	$4.00
Wrought, broken kegs, per 100 lb., list less.....	2.00
Turnbuckles:	
With stub ends, list less.....	20%
Without stub ends, list less.....	50%
Chain:	
Proof coil, base, per 100 lb., net.....	$7.10
Cast iron welding flux, per lb., net.....	.40
Brazing flux, per lb., net.....	.80

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Equipment Wanted

Mass., Cambridge (Boston P. O.) — A. F. Robinson Boiler Works—machinery and equipment for proposed 40 x 195 ft. factory.

Mass., Neponset — George Lawley & Sons Corp., 26 Cricsson St.—machinery and equipment for proposed boat manufacturing and storage building. Estimated cost $25,000.

N. Y., Elmhurst — Dept. of Sanitation, Municipal Bldg., New York, M. Goodwin in charge, soon takes bids motor repair equipment for Elmhurst shops.

N. Y., West New Brighton (sta. Staten Island) — Dept. of Sanitation, M. Goodwin, Municipal Bldg., New York, soon takes bids motor repair equipment for West New Brighton shops.

O., Columbus — J. E. McNally Lumber Co., 1655 Snider Ave., B. Lang, Gen. Mgr.—double surfacing machine, sticker and small combination wood working machine.

Tex., Abilene — Central Texas Iron Works, Waco, c/o W. Winchell—steel mill equipment, including cutters, rollers, etc., for proposed 3 story, 50 x 200 ft. steel plant here.

Ont., Brantford—Brantford Oven & Rack Co. —machinery and equipment for the manufacture of ovens and racks for stoves for proposed 1 story, 100 x 150 ft. addition to factory. Estimated cost $50,000.

Ont., Hamilton — City Council — interested prices on complete equipment for proposed 52 x 105 ft. machine and repair shops. Estimated cost $70,000.

Ont., Petrolea — Oil Well Supply Co. Ltd., Robert St., J. A. McKenzie, Mgr.—interested prices complete equipment for plant for the manufacture of oil well pumping and drilling supplies to replace fire loss.

Opportunities for Future Business

Calif., San Diego—Bureau of Yards & Docks, Navy Dept., plans extension to erection shop and battery and metal shop.

Calif., San Diego—San Diego State Teachers College, received lowest bid for the construction of a 2 story training school including shop, etc. $137,645. G. B. McDougall, Public Works Bldg., Sacramento, Archt. Noted Nov. 21.

Ind., Cambridge City—White Star Oil Co., had plans prepared for the construction of a machine shop and service station at Main and Milton Rd. Estimated cost $43,100. Werking, Werking & Fallon, Richmond, Archts.

Ind., Indianapolis—Gaseteria Oil Co., 1801 Madison Ave., is having plans prepared for the construction of a machine shop and service station. Estimated cost $43,000. Private plans.

Ind., Indianapolis—Lincoln Oil Co., 121 East Maryland Ave., is having plans prepared for the construction of a machine shop and service plant at College and Sutherland Aves. Estimated cost $47,000. Vonnegut, Bohn & Mueller, 610 Indiana Trust Bldg., Archts.

Ind., Warsaw—Gatke Brake Co., had plans prepared for the construction of a 2 sotry, 40 x 80 ft. factory. Estimated cost $41,000. Private plans.

Md., Baltimore—Argonaut Realty Corp., c/o A. Kahn, Inc., 1000 Marquette Bldg., Engr., will soon award contract for the construction of a 1 and 2 story, 113 x 280 ft. factory at Key Highway and Fort Ave.

Mass., Cambridge (Boston P. O.) — A. F. Robinson Boiler Works, Second St. E., is receiving bids for addition and alterations to factory, 1 story, 40 x 195 ft. at Second and Binney Sts. Estimated cost $50,000. D. C. Landry, 107 Massachusetts Ave., Boston, Archt.

Mass., Hyde Park (sta. Boston)—Englander Spring Bed Co., 1604 Hyde Park Ave., will soon award contract for the construction of a 3 story, 40 x 60 ft. factory. Estimated cost $50,000. J. W. Pearson & Co., 25 Huntington Ave., Boston, Archts.

Mich., Detroit—Chicago Pneumatic Tool Co., 6 East 47th St., New York, N. Y., will receive bids end of January for the construction of a plant, here. Estimated cost to exceed $40,000. Van Leyen, Schilling & Keough, 3440 Cass Ave., Detroit, Archts. and Engrs. Noted Jan. 2.

Mich., Grand Rapids—Pere Marquette Railway, Fort St., Union Depot, is having plans prepared for the construction of a car repair shop and material storage building on Wyoming St. Estimated cost $75,000. Private plans. H. A. Cassil, Detroit, Ch. Engr.

N. J., Newark—Bd. of Education, City Hall, will receive bids about Jan. 15 for the construction of a 3 story, 100 x 120 ft. school of industrial arts at High and William Sts. Estimated cost $850,000. Guilbert & Betelle, 20 Branford Pl., Archts.

N. J., Passaic — Continental Can Co., Inc., Brooks Ave., awarded contract for the construction of a 1 story, 50 x 110 ft. mill. Estimated cost $40,000.

N. J., Newark—Westinghouse Electric & Mfg. Co., 17 Academy St., awarded contract for the construction of a 2 story, 300 x 330 ft. factory at Haynes Ave. and State Highway No. 25. Estimated cost $500,000.

N. J., North Hackensack—C. V. R. Bogert, 210 Main St., Hackensack, Archt., will receive bids about Jan. 15, for the construction of a 1 story workshop and warehouse at Hackensack Ave. and Temple St. for Hackensack Water Co., Main St., Hackensack. Estimated cost $40,000. Noted Nov. 28.

N. J., Roselle—Hubeney Bros., 617 East First Ave., is having preliminary plans prepared for a 1 story addition to machine shop. Estimated cost $40,000. W. L. Finne, 1201 East Grand St., Elizabeth, Archt.

Every one of these items is reported by our authorized correspondents who are instructed to verify every item sent in. This free weekly service is published in the interests of the buyer and the seller, to bring them together and get machinery moving.

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BUSINESS NEWS DEPARTMENT
Tenth Ave. at 36th St., New York

N. Y., Albany—Bd. of Education, plans the construction of a 3 story high school, including manual training department, machine shop, etc., at Manning and Northern Blvds. Estimated cost $1,000,000. A. Delehanty, 121 North Pearl St., Archt.

N. Y., Brooklyn—Bd. of Education, 500 Park Ave., New York, plans the construction of a 7 story technical high school including forty shops, seven miscellaneous shops, one foundry, etc., at DeKalb Ave. and Greene and Elliott Pl. Estimated cost $6,000,000. W. C. Martin, Archt.

N. Y., Brooklyn—Goetz Bros., 153 Pierrepont St., plans the construction of a 2 story, 65 x 132 ft. garage at Newkirk Ave. and Marlborough Rd. Estimated cost $100,000. Seelig & Finkelstein, 153 Pierrepont St., Archts.

N. Y., Brooklyn—Mindor Development Corp., S. Witkin, Pres., 11 West 42nd St., New York, will build a 2 story garage at 86 Butler St., here. Estimated cost $40,000. M. Klein, 65 Court St., Archt.

N. Y., Brooklyn—R. Oliva, 1987 New York Ave., plans the construction of a 100 x 160 ft. garage at East 18th St. and Ave. Y. Estimated cost $80,000. Private plans.

N. Y., Long Island City—Rosen & Paynes, 242 Sumner Ave., Brooklyn, will build a 91 x 105 ft. garage on Main St., here. Estimated cost $50,000. M. Klein, 65 Court St., Archt.

N. Y., New York—Felco Realty Corp., 250 West St., awarded contract for the construction of a garage at 99 Charles St. Estimated cost $50,000.

N Y., New York—R. Hoe & Co., 138th St. and East River, awarded contract for a 3 story addition to press manufacturing plant at Walnut and 137th Sts. Estimated cost $125,000. Noted Dec. 26.

N. Y., Ridgewood—Rubel Coal & Ice Co., 937 Fulton St., will receive bids about Jan. 6 for the construction of a garage. Estimated cost $100,000. H. J. Nurick, 44 Court St., Archt.

N. Y., St. George (sta. Staten Island)—Dept. of Water, Gas & Electricity, New York, bids late in January for the construction of a 42 x 75 ft. garage and repair shop at Ontario Ave. and Victory Blvd. Estimated cost $60,000. Sibley & Fetherstone, 205 East 42nd St., New York, Archts. Noted Dec. 26.

N. Y., Syracuse—DeWitt Development Corp., plans the construction of a 4 story garage at 422 South Clinton St. Estimated cost $150,000. G. Young, McCarthy Bldg., Archt.

O., Cleveland — Cleveland Commercial Auto Body Co., J. Schuld, Secy., 1717 East 45th St., awarded contract for a 1 story, 38 x 94 ft. addition to factory. Estimated cost $40,000. Noted Jan. 2.

O., Cleveland—Lamson & Sessions Bolt Co., 1971 West 85th St., plans a 1 story addition to factory at 3103 27th Ave N. Estimated cost $45,000.

O., Cleveland—Sherwin Williams Co., 601 Canal St., is having plans prepared for the construction of an iron oxide manufacturing plant. Estimated cost to exceed $150,000. Private plans.

Okla., Tulsa—Bd. of Education, Administration Bldg., will soon award contract for the construction of a shop building adjoining Roosevelt junior high school at West Easton and Quanah Aves. L. I. Shumway, 712 Alexander Bldg., Archt.

La., Baton Rouge—East Baton Rouge Parish, c/o J. Gebbelin, Pres., Parish Police Jury, will receive bids about Feb. 1 for an airport development, including hangars, administration building, machine shops, etc. Estimated cost $160,000. Jones, Roessle & Olschner, Reymond Bldg., Archts.

Pa., Philadelphia—Gimbel Bros., Broadway and 33rd St., New York, N. Y., will receive bids late in February for the construction of a garage here. Abbott Merkt Co., 175 5th Ave., Engrs.

Texas—Stock or Co-Operative Co., c/o Chamber of Commerce, Marfa, are having plans prepared for the construction of an ore smelter plant at junction of Conchas and Rio Grande rivers at a point four miles north of Presidio. Estimated cost $3,000,000.

Tex., San Antonio — International Harvester Co., 1124 South Flores St., awarded contract for the construction of a 1 and 2 story, 87 x 250 ft. warehouse. Estimated cost $150,000.

Wis., Kenosha—Snap-On Wrench Co., 14 East Jackson Blvd., Chicago, Ill., awarded contract for the construction of a 1 story, 200 x 330 ft. factory and 80 x 100 ft. office here. Estimated cost $175,000. Noted Oct. 31.

Wyo., Laramie—National Lumber & Creosoting Co., 5601 Fox St., Denver, Colo., has work under way on the construction of a creosoting plant for treating telephone and telegraph poles here. Estimated cost $40,000.

Ont., St. Catharines—Packard Electric Co., Race St., plans the construction of a plant for the manufacture of electric motors. Estimated cost $250,000. Private plans.

Ont., Toronto—Canadian Scale Co., 41 Ossington Ave., awarded contract for a 2 story, 66 x 102 ft. addition to factory. Estimated cost $75,000.

Ont., Toronto—J. F. Raw, 56 Adelaide St. E., plans the construction of a 4 or 5 story blue printing plant and engineering instrument factory. Estimated cost $100,000. M. Brown, Confederation Life Bldg., Archt.

Ont., Toronto—G. Rathbone Lumber Co., 10 Northcote Ave., awarded contract for a 3 story addition to woodworking plant. Estimated cost $125,000. Noted Nov. 28.